D.M. BALL
& ASSOCIATES
PTY LTD
Building Certification
ABN 16 090 100 986

CONSTRUCTION CERTIFICATE

Issued under the Environmental Planning and Assessment Act 1979
Section 109C (1) (b), 81A (2) and 81A (4)

CONSTRUCTION CERTIFICATE No. 214/12

Applicant	Brian Whealing 51A Parkes Street MANLY VALE NSW 2093
Owner	Brian & Katherine Whealing 51A Parkes Street MANLY VALE NSW 2093
Subject Land	Lot 2, DP. 1177671, (Formerly known as Lot 123, DP. 13152) No. 100A Wakehurst Parkway ELANORA HEIGHTS NSW 2101
Description of Development	Type of work: Building Description: Dwelling and garage
Development Consent	Development Consent No. N0352/07 Date of determination: 20th December, 2007
Building Code of Australia (BCA) Building Classification	Dwelling- Class 1a Garage- Class 10a
Builder	Brian Whealing 51A Parkes Street MANLY VALE NSW 2093 O/B Permit No. 397142P
Value of Work	$450,000-

$36 Rec: 334133 11/12/12

Suite 1, 84 Bathurst Street, Liverpool NSW 2170
PO Box 820 Liverpool BC NSW 1871
• Phone: (02) 9822 4911 • Fax: (02) 9822 5977 • Email: admin@dmball.com.au •

Determination

Approved

Date of determination: 7th December, 2012

Attachments

-Copy of Development Consent No. N0352/07

-Colour schedule

-Owner Builder's Permit

-Geotechnical risk management policy for Pittwater

-Geotechnical assessment from Jeffery & Katauskas P/L

-Vegetation and habitat assessment landscape and ecological sustainability concept plan from Syncarpia Vegetation Management

-Erosion and sediment control plan

-Sydney Water stamped plan

-Bushfire risk assessment report from Fire Base Consulting

-Excavation schedule of works

-Construction traffic management plan

-Receipt for payment of the Long Service Levy

-Geotechnical advice from Jeffery and Katauskas P/L

-Certificate for the driveway access from Docherty Consulting Engineers & Form 2

-BASIX Certificate

-Arborist's report from Biodesign & Associates P/L

-Surface water detail drawings

-Level 1 Bushfire Requirements

-Certificate for the bushfire design from Waddington Consulting Pty Ltd

-Title search

-Geotechnical advice & review of structural drawings from JK Geotechnics + Form 2 dated 6/12/12

Plans and Specifications Approved

-Architectural drawings MFArchitecture
*Project No. 10008, Drawing No. A-000-001, A-100-001, A-110-000, A-110-001, A-110-002, A-110-003, A-110-004, A-111-000, A-111-001, A-111-002, A-111-003, A-210-001, A-210-002, A-210-003, A-210-004, A-310-001, A-310-002, A-310-003, A-310-004, A-310-005, A-520-001, A-520-002, A-520-004, A-520-005, A-520-006, A-520-007, A-520-008, A-541-001, A-542-001, A-546-001, A-546-002 & A-641-001

-Structural drawings by Docherty Consulting Engineers
*Project No. 110104, Drawing No. S00, S01 & S02, Rev.0

-Stormwater drawings by Waddington Consulting P/L
*Drawing No. 9234-C1.00, C1.01, C2.00, C2.01 & C2.02

Certificate

I certify that the work if completed in accordance with these plans and specifications will comply with the requirements of the Environmental Planning and Assessment Regulation 2000 as referred to in Section 81A(5) of the Environmental Planning and Assessment Act 1979.

Signature: _____

Date of endorsement: 7th December, 2012

Certificate No. 214/12

Certifying Authority

Name: Darren Ball

Accreditation No. BPB0019

Phone: 02-98224911

Address: D.M Ball & Associates Pty Ltd
PO Box 820 LIVERPOOL BC NSW 1871

Note: The Construction Certificate approval shall lapse concurrently with Development Consent No. N0352/07 on the 20th December, 2012.

Schedule to Construction Certificate Application No. 214/12
Lot 2, DP. 1177671, No. 100A Wakehurst Parkway, Elanora Hgts

Particulars of The Proposal

What is the area of the land (m^2) _1299_____
Gross floor area of existing building (m^2)_N/A_____
What are the current uses of all or parts of the building(s)/land?
(If vacant state vacant)_Vacant_____

Location Use

Does the site contain a dual occupancy?_No_____
What is the gross floor area of the proposed addition or new building (m^2)__306_____
What are the proposed uses of all parts of the building(s)/land?

Location Use
Dwelling_____Residential_____

Number of pre-existing dwellings_Nil_____

Number of dwellings to be demolished__Nil_____

How many dwellings are proposed? _1_____

How many storeys will the building consist of? _3_____

Materials To Be Used

Place a tick ( ) in the box which best describes the materials the new work will be constructed of:

walls	**code**	**roof**	**code**
brick veneer	12	aluminium	70
full brick	11	concrete	20
single brick	11	concrete tile	10
concrete block	11	fibrous cement	30
concrete/masonry	20	fibreglass	80
concrete	20	masonry/terracotta shingle	
steel	60 √	tiles	10
fibrous cement	30	slate	20
hardiplank	30	steel	60 √
timber/weatherboard	40	terracotta tile	10
cladding-aluminium	70	other	80
curtain glass	50	unknown	90
other	80		
unknown	90		

floor		**frame**	
concrete	20	timber	40 √
timber	10 √	steel	60
other	80	other	80
unknown	90	unknown	90

NSW GOVERNMENT | Planning

PLANNING circular

PLANNING SYSTEM	
State environmental planning policies	
Circular	PS 10-013
Issued	1 June 2010
Related	

Environmental Planning and Assessment Amendment (Development Consents) Act 2010

This circular outlines the effect of the *Environmental Planning and Assessment Amendment (Development Consents) Act 2010* and associated changes to the Environmental Planning and Assessment Regulation 2000 for councils, accredited certifiers and the community.

Introduction

The *Environmental Planning and Assessment Amendment (Development Consents) Act 2010* (the Amending Act) commenced on 26 May 2010.

The primary purpose of the Amending Act is to extend the lapsing period of existing development consents that were subject to a reduction under section 95(2) of the *Environmental Planning and Assessment Act 1979* (the EP&A Act). The lapsing period has been extended to the maximum five years allowed by the EP&A Act.

The Amending Act prevents a consent authority from reducing the lapsing period of any consent granted to less than the maximum five year period until 1 July 2011.

The Amending Act also allows a regulation to be made setting out what does or does not constitute physical commencement.

Effects on existing development consents

As a result of the Amending Act, existing development consents subject to a lapsing period of less than five years will have their lapsing periods extended to the maximum five year period.

The extension of the lapsing period does not apply to development consents that lapsed before 22 April 2010. However, the provisions in the Amending Act apply to consents that would have otherwise lapsed during the passage of the Bill.

Determining the new lapsing date

In order to determine if a development consent is subject to an extension of the lapsing period the following questions need to be asked:

1. Was the development consent subject to a reduction of the lapsing period under section 95(2) of the EP&A Act?

2. Was the development consent operating on 22 April 2010?

If the answer to both questions is 'yes', then the consent will not lapse until five years after the date from which the consent operated.

Period during which the Act provisions apply

Development consents granted after the Amending Act is assented to must be subject to the maximum five year lapsing period.

These arrangements will remain in place until the date of assent. The Amending Act provisions will apply until 1 July 2011.

From that date a consent authority will again be able to reduce the lapsing period to less than five years (unless a regulation is made).

ABN61340837871
Telephone 02 9970 1111
Facsimile 02 9970 715?
Postal Address
PO Box 882
Mona Vale NSW 1660
DX 9018, Mona Vale

Business Hours:
8.00am to 5.30pm, Monday to Thursday
8.00am to 5.00pm, Friday

DA No: N0352/07

5 yr Confirm

10 November 2009

MIKE FORAN ARCHITECTURE
P O BOX 684
WAUCHOPE 2446

Dear Sir/Madam

Extension of Development Consent for the erection of a new dwelling house and separate garage

100 WAKEHURST PARKWAY, ELANORA HEIGHTS

Pursuant to Section 95A of the Environmental Planning and Assessment Act, 1979 (as amended), please be advised that an extension of the above Development Consent has been granted to 20 December 2010.

Please note that the consent will lapse if building, engineering or construction work relating to the building is not physically commenced on the land to which the consent applies by this date.

Yours faithfully

D Pearson

Deren Pearson
Development Planner

NB.
~~Original DA approval date Dec 2007~~
~~Expires 2yrs Dec 2009~~
~~Extension granted to Dec 2010~~
✓ New laws 5 x yrs min = Dec 2012

PITTWATER COUNCIL

DA

New Dwelling

ABN61340837871
Telephone 02 9970 1111
Facsimile 02 9970 7150
Postal Address
PO Box 882
Mona Vale NSW 1660
DX 9018, Mona Vale

Business Hours:
8.00am to 5.30pm, Monday to Thursday
8.00am to 5.00pm, Friday

DA No: N0352/07

20 December 2007

MIKE FORAN ARCHITECTURE
P O BOX 417
MANLY NSW 1655

Dear Sir/Madam

Development Application for To erect a new dwelling house and separate garage at 100 WAKEHURST PARKWAY ELANORA HEIGHTS NSW 2101.

I am pleased to advise that this application has been approved and I attach for your assistance a copy of the Development Consent, the conditions of approval and a copy of the approved plans.

If building works are involved, prior to proceeding with the proposal, it will be necessary for you to lodge a Construction Certificate Application with either Council or an accredited Certifier.

I take this opportunity to direct your attention to Section C of the Consent which details the matters to be satisfied prior to issue of the Construction Certificate.

Additionally, for your reference, please find enclosed Information Sheets that will assist in providing information you will need to consider for the processes following on from receiving this consent.

If there are any matters relating to this approval which require further explanation, please contact me prior to commencing work on the site.

Enquiries relating to the Construction Certificate application should be directed to Council's Customer Service or your private certifier.

Yours faithfully

J Marshall

Joanne Marshall
SENIOR PLANNER

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ABN61340837871
Telephone 02 9970 1111
Facsimile 02 9970 7150
Postal Address
PO Box 882
Mona Vale NSW 1660
DX 9018, Mona Vale

CONSENT NO: N0352/07
ENVIRONMENTAL PLANNING & ASSESSMENT ACT, 1979 (AS AMENDED)
NOTICE TO APPLICANT OF DETERMINATION
OF A DEVELOPMENT APPLICATION

Applicants Name and Address:
MIKE FORAN ARCHITECTURE
P O BOX 417
MANLY 1655

Being the applicant in respect of Development Application No **N0352/07**

Pursuant to section 80(1) of the Act, notice is hereby given of the determination by Pittwater Council, as the consent authority, of Development Application No **N0352/07** for:

To erect a new dwelling house and separate garage.

At: 100 WAKEHURST PARKWAY, ELANORA HEIGHTS (Lot 123 DP 13152)

Decision:

The Development Application has been determined by the granting of consent based on information provided by the applicant in support of the application, including the Statement of Environmental Effects, and in accordance with **Drawings No. 101, 105 (dated 13/04/07), 210, 310, 410 & 107 Revision A dated 25/10/07 prepared by Mike Foran Architecture; the Geotechnical Assessment report dated 17 April 2007 prepared by Jeffery and Katauskas Pty Ltd; the Arborist's report dated April 2007 prepared by Sue Hobley; and a Bushfire Risk Assessment report dated 11/03/07 prepared by Fire Base Consulting** as amended in red (shown clouded) or as modified by any conditions of this consent.

The reason for the imposition of the attached conditions is to ensure that the development consented to is carried out in such a manner as to achieve the objectives of the Environmental Planning and Assessment Act 1979 (as amended), pursuant to section 5(a) of the Act, having regard to the relevant matters for consideration contained in section 79C of the Act and the Environmental Planning Instruments applying to the land, as well as section 80A of the Act which authorises the imposing of the consent conditions.

Endorsement of date of consent 20 December 2007

Mark Ferguson
GENERAL MANAGER
Per: JMarshall.

PITTWATER COUNCIL

ABN61340837871
Telephone 02 9970 1111
Facsimile 02 9970 7150
Postal Address
PO Box 882
Mona Vale NSW 1660
DX 9018, Mona Vale

Conditions of Approval

This consent is not an approval to commence building work. The works associated with this consent can only commence following the issue of the Construction Certificate.

Note: Persons having the benefit of development consent may appoint either a council or an accredited certifier as the principal certifying authority for the development or for the purpose of issuing certificates under Part 4A of the Environmental Planning and Assessment Act. When considering engaging an accredited certifier a person should contact the relevant accreditation body to ensure that the person is appropriately certified and authorised to act in respect of the development.

A. Prescribed Conditions:

✓ 1. All works are to be carried out in accordance with the requirements of the Building Code of Australia.

BW 2. In the case of residential building work for which the Home Building Act 1989 requires there to be a contract of insurance in force in accordance with Part 6 of that Act, there is to be such a contract in force.

✓ 3. Critical stage inspections are to be carried out in accordance with clause 162A of the Environmental Planning & Assessment Regulation 2000. To allow a Principal Certifying Authority or another certifying authority time to carry out critical stage inspections required by the Principal Certifying Authority, the principal contractor for the building site, or the owner-builder must notify the Principal Certifying Authority at least 48 hours before building work is commenced and prior to further work being undertaken.

✓ 4. A sign must be erected in a prominent position on any site on which building work, subdivision work or demolition work is being carried out:

   a. showing the name, address and telephone number of the Principal Certifying Authority for the work, and
   b. showing the name of the principal contractor (if any) for any building work and a telephone number on which that person may be contacted outside working hours, and
   c. stating that unauthorised entry to the work site is prohibited.

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ABN 61340837871
Telephone 02 9970 1111
Facsimile 02 9970 7150
Postal Address
PO Box 882
Mona Vale NSW 1660
DX 9018, Mona Vale

Any such sign is to be maintained while the building work, subdivision work or demolition work is being carried out, but must be removed when the work has been completed.

BW 5. Residential building work within the meaning of the Home Building Act 1989 must not be carried out unless the Principal Certifying Authority for the development to which the work relates (not being the Council) has given the Council written notice of the following information:

a. in the case of work for which a principal contractor is required to be appointed:

i. the name and licence number of the principal contractor, and
ii. the name of the insurer by which the work is insured under Part 6 of that Act.

b. in the case of work to be done by an owner-builder:

i. the name of the owner-builder, and

ii. if the owner-builder is required to hold an owner-builder permit under that Act, the number of the owner-builder permit.

✓ 6. If arrangements for doing the residential building work are changed while the work is in progress so that the information notified under subclause (2) becomes out of date, further work must not be carried out unless the Principal Certifying Authority for the development to which the work relates (not being the Council) has given the Council written notice of the updated information.

✓ 7. The hours of construction are restricted to between the hours of 7.00am and 5.00pm Monday - Friday and 7.00am to 1.00pm on Saturdays. No works are to be carried out on Sundays or Public Holidays. Internal building work may be carried out at any time outside these hours, subject to noise emissions from the building or works not being audible at any adjoining boundary.

✓ 8. All bushrock/sandstone within the areas of approved development works (e.g. dwelling and garage footprints) is to be retained and utilised on site as part of the landscape works. The area of the site above the 40 metre contour (i.e. the area above the escarpment) is to be retained and managed as bushland in a self-sustaining and weed free state for the life of the development.

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Facsimile 02 9970 7150
Postal Address
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Mona Vale NSW 1660
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B. Matters to be incorporated into the development and maintained over the life of the development:

BW Eng.

1. The recommendation of the risk assessment required to manage the hazards as identified in Geotechnical Report prepared by Jeffrey and Katauskas are to be incorporated into the construction plans.

✓

2. As part of an integrated on-site stormwater management system, stormwater overflow from the rainwater tank and or on site detention tank is to be discharged to the public drainage system either directly to the kerb and gutter, natural water course or piped drainage system or via an inter-allotment drainage easement within adjacent private property.

✓

3. The structure shall incorporate gutterless roofing or leafless guttering to prevent the build up of flammable material. Roller doors, tilt-a-doors and the like shall be sealed to prevent the entry of embers into the structure. The entire property shall be managed as an 'Inner Protection Area' as outlined within Planning for Bush Fire Protection 2006 and the Service's document 'Standards for asset protection zones'. In recognition of the potentially unreliable reticulated water supply in residential areas and that the distance from the proposed dwelling to the nearest hydrant is greater than 90 metres a 5,000 litre dedicated water supply tank shall be provided. A 65mm storz fitting and ball or gate valve shall be installed in the tank.

✓

4. The installation of in-sink food waste disposal units is prohibited due to the increased loading placed on the Warriewood Sewage Treatment Plant particularly during wet weather.

✓

5. The solid fuel or wood burning appliances shall comply with Australian Standard AS 4013-1992 or any subsequent amending standard.

✓

6. Noise from the operation of any plant or equipment at the premises shall not exceed 5dB(A) above the background noise level.

✓

7. All plumbing and drainage fixtures are to be concealed and not exposed to public view on buildings over one storey in height.

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ABN61340837871
Telephone 02 9970 1111
Facsimile 02 9970 7150
Postal Address
PO Box 882
Mona Vale NSW 1660
DX 9018, Mona Vale

8. All external glazing is to have a maximum reflectivity index of 25%.

9. New electrical connections are to be carried out using underground cabling.

10. Materials and colour schemes are to be in accordance with the samples submitted to Council with the application. No white or light coloured roofs are permitted.

11. Timber log retaining walls are not permitted and are not to be included in the proposed development.

12. The proposed works are to maintain a one metre building line to the western boundary measured parallel to the allotment boundary.

13. The commitments identified in the BASIX Certificate and on the plans or specifications are to be fulfilled and maintained for the life of the development.

14. Four locally native canopy trees are to be planted on the site to replace existing specimens that will be removed. To maintain current tree diversity, two of these trees are to be Eucalyptus piperita and two are to be E.botryoides. All native trees are to be retained for the life of the development, or for their safe natural life. Trees that die or are removed must be replaced with another locally native canopy tree.

15. The existing landscaping required to be retained together with any additional landscaping required by this Development Consent is to be maintained for the life of the development.

16. All natural landscape features, including natural rock outcrops, natural vegetation, soil and watercourses, are to remain undisturbed except where affected by necessary works detailed on approved plans.

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ABN61340837871
Telephone 02 9970 1111
Facsimile 02 9970 7150
Postal Address
PO Box 882
Mona Vale NSW 1660
DX 9028, Mona Vale

confirm - geofeth
- Google position

17. The large boulder with two Port Jackson Fig trees growing on it (Nos. 21 & 22 in Arborist's report) is to remain undisturbed. The identified trees are to be retained for the life of the development, or for their safe natural life.

18. In accordance with Pittwater Council's Tree Preservation and Management Order, all existing trees as indicated on Survey Plan Prepared by DP Surveying Services Reference No 1510 dated 14 Aug & 15 Dec 2006 shall be retained except where Council's prior written consent has been obtained, or where after approval of the relevant Construction Certificate Application/s, trees stand within the envelope of approved buildings or within the alignment of approved permanent paved vehicular access roads and parking areas.

19. A minimum of 200mm clearance is to always be maintained to the tree trunk from proposed bearers, joists and decking.

20. Four locally native canopy trees are to planted on the site to replace existing specimens that will be removed. To maintain current tree diversity, two of these trees are to be Eucalyptus piperita and two are to be E.botryoides. All native trees are to be retained for the life of the development, or for their safe natural life. Trees that die or are removed must be replaced with another locally native canopy tree. For the life of the development no bush rock is to be removed from site without prior approval from Pittwater Council. The removal or destruction of bush rock has been listed as a Key Threatening Process under the NSW Threatened Species Conservation Act, 1995.

21. The landowner must comply with all aspects of the approved Ecological Sustainability Plan prepared by Julia Stanton dated May 2007 over the life of the development.

22. Where fencing is required to contain a domestic animal the enclosed area shall be up to 25% of the site cover and in a location that does not impede passage of native wildlife between sites.

23. For the life of the development Cats are to be kept in a cat run and / or inside the dwelling such that they are prevented from entering wildlife habitat areas at all times. Dogs are to be kept in an enclosed area such that they cannot enter areas of bushland, unrestrained, on the site or surrounding properties.

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ABN61340837871
Telephone 02 9970 1111
Facsimile 02 9970 7150
Postal Address
PO Box 882
Mona Vale NSW 1660
Street 8, Mona Vale

24. Any vegetation planted outside approved landscape zones is to be consistent with:
d. Species listed in the Ecological Sustainability Plan
e. Species listed from the Endangered Ecological Community
f. Locally native species or locally native plants growing on site and / or selected from the list pertaining to vegetation community(s) on the site as per the Pittwater Book *Native Plants for Your Garden* - book available from Council and on the Pittwater Web Site.

25. Trees shown on drawing No DA101 Revision A dated 25/10/07 are to be retained for the life of the development, or for their safe natural life. Trees that die or are removed must be replaced with another locally native canopy tree.

26. Over the life of the development all declared noxious weeds under are to be managed / removed in accordance with the Noxious Weeds Act 1993. Environmental weeds are to be removed and/or controlled.

27. No environmental weeds are to be planted on the site.

28. For the life of the development no bush rock is to be removed or destroyed without prior approval from NSW Department of Environment and Conservation and Pittwater Council. The removal or destruction of bush rock has been listed as a Key Threatening Process under the NSW Threatened Species Conservation Act, 1995.

29. Bushland is to be in the same (or better condition) post development as it is prior to development except in the location of the zone of approved development on the site. The Ecological Sustainability Plan prepared by Julia Stanton dated May 2007 is to be implemented. Prior to issue of Occupation Certificate a site inspection is to be made and compliance with the approved Plan is to be certified by the Bushland Management Consultant. Bushland as per approved plan is to be retained for the life of the development.

30. Fencing is to be passable by Native Wildlife.

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ABN61340837871
Telephone 02 9970 1111
Facsimile 02 9970 7150
Postal Address
PO Box 882
Mona Vale NSW 1660
DX 9018, Mona Vale

C. Matters to be satisfied prior to the issue of the Construction Certificate:

Note: All outstanding matters referred to in this section are to be submitted to the accredited certifier together. Incomplete Construction Certificate applications / details cannot be accepted.

Done ? 1. Prior to issue of the Construction Certificate, details are to be submitted to the Principal Certifying Authority that include, but are not limited to, all of the recommended conditions in the Geotechnical Report prepared by Jeffrey and Katauskas .Form 2 of the Geotechnical Risk Management Policy for Pittwater is to be completed and submitted with the above details before issue of the Construction Certificate.

Done with Sub Div DA ?

Eng Arch 2. Plans and a certificate submitted by a chartered Professional Engineer, Architect or Surveyor, confirming to the satisfaction of the Accredited Certifier or Council that the access driveway and internal driveway complies with the requirements of Pittwater 21 DCP Control B6.1 are to be submitted with the Construction Certificate application.

BW Arch 3. Erosion and Sediment Management Plan is to be submitted to the Accredited Certifier or Council with the Construction Certificate application. Control over discharge of stormwater and containment of run-off and pollutants leaving the site/premises shall be undertaken through the installation of erosion control devices such as catch drains, diversion drains, energy dissipaters, level spreaders and sediment control devices such as hay bale barriers, filter fences, filter dams, sedimentation basins. Such plan is to be a accompanied by a certification from an appropriately qualified person, that the plans/ details have been designed in accordance with the requirements of the N.S.W. Department of Land and Water Conservations *Urban Erosion and Sediment Control* manual.

(Done ?) See sediment control plan

The plan is to include specific details required to remove clay from vehicles leaving the site so as to maintain public roads in a clean condition.

Arch Eng 4. Submission of construction plans and specifications and documentation which are consistent with the approved Development Consent plans, the requirements of Building Code of Australia and satisfy all conditions shown in Part B above are to be submitted to the Principal Certifying Authority.

Recd ? 5. The Accredited Certifier or Council must be provided with a copy of plans that a Quick Check agent/Sydney Water has stamped before the issue of any Construction Certificate.

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ABN61340837871
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Postal Address
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Eng Geotech

6. A Schedule of Works prepared by a qualified practising Structural Engineer with corporate membership of the Institute of Engineers Australia (M.I.E), or who is eligible to become a corporate member and has appropriate experience and competence in the related field is to be submitted to the Accredited Certifier or Council in respect of the following items:

1. The details and location of all intercept drains, provided uphill of the excavation, to control runoff through the cut area.
2. The proposed method of disposal of collected surface waters is to be clearly detailed;
3. Procedures for excavation and retention of cuts, to ensure the site stability is maintained during earthworks.

✓

7. Dwellings in bushfire prone areas are to be designed and constructed in accordance with Level 1 AS 3959-1999 Construction of Buildings in Bush Fire Prone Areas. Construction specifications to achieve this are to be provided to the Principal Certifying Authority with the Construction Certificate application.

Arch

8. Detailed design and construction methods for the proposed pathway leading up to the dwelling from the garage area are to be submitted for approval by Council prior to release of the Construction Certificate. These details are to be accompanied by an arborist report certifying the proposed pathway can be constructed as proposed without significant impact on the long term health of the tree identified as tree number 10 (Synoum glandulosum (Scented Rosewood). The arborist report is to include tree protection and management measures to be implemented during and following construction works.

Arch
Arborist

9. Detailed design and construction methods for the proposed pathway leading up to the dwelling from the garage area are to be submitted for approval by Council prior to release of the Construction Certificate. These details are to be accompanied by an arborist report certifying the proposed pathway can be constructed as proposed without significant impact on the long term health of the tree identified as tree number 10 (Synoum glandulosum (Scented Rosewood). The arborist report is to include tree protection and management measures to be implemented during and following construction works.

PITTWATER COUNCIL

ABN61340837871
Telephone 02 9970 1111
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Postal Address
PO Box 882
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DX 9018, Mona Vale

D. Matters to be satisfied prior to the commencement of works and maintained during the works:

Note: It is an offence to commence works prior to issue of a Construction Certificate.

N/A ✓ 1. All excavated material is to be removed from the site. This is due to the sites location in an area identified as being subject to possible landslip.

N/A ✓ 2. All excavations and backfilling associated with the erection or demolition of a building must be executed safely and in accordance with appropriate professional standards.

✓ 3. All excavations associated with the erection or demolition of a building must be properly guarded and protected to prevent them from being dangerous to life or property.

✓ 4. Where excavations extend below the level of the base of the footings of a building on an adjoining allotment of land, the person causing the excavation must preserve and protect the building from damage and, if necessary, underpin and support the adjoining building in an approved manner.

✓ 5. Sedimentation and erosion controls are to be effectively maintained at all times during the course of construction and shall not be removed until the site has been stabilised or landscaped to the Principal Certifying Authoritys satisfaction.

✓ 6. Adequate measures shall be undertaken to remove clay from vehicles leaving the site so as to maintain public roads in a clean condition.

✓ 7. No works are to be carried out in Councils Road Reserve without the written approval of the Council.

✓ 8. A Road Opening Permit, issued by Council, must be obtained for any road openings, or excavation within Councils Road Reserve associated with the development on the site, including stormwater drainage, water, sewer, electricity, gas and communication connections. During the course of the road opening works the Road Opening Permit must be visibly displayed at the site.

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ABN61340837871
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Postal Address
PO Box 882
Mona Vale NSW 1660
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9. No skip bins or materials are to be stored on Councils Road Reserve.

10. A site fence and silt and sediment control fence is to be erected and maintained during the course of works along any street boundary and park/reserve boundary to the site.

11. A clearly legible *Site Management Sign* is to be erected and maintained throughout the course of the works. The sign is to be centrally located on the main street frontage of the site and is to clearly state in legible lettering the following: -
The builders name, builders telephone contact number both during work hours and after hours.
That no works are to be carried out in Councils Road Reserve without the written approval of the Council.
That a Road Opening Permit issued by Council must be obtained for any road openings or excavation within Councils Road Reserve associated with development of the site, including stormwater drainage, water, sewer, electricity, gas and communication connections. During the course of the road opening works the Road Opening Permit must be visibly displayed at the site.
That no skip bins or materials are to be stored on Councils Road Reserve.
That the contact number for Pittwater Council for permits is 9970 1111.

BW Traffic Plan

12. A satisfactory construction traffic management plan (CTMP) prepared by a suitably qualified traffic consultant is required to be submitted to the Private Certifying Authority prior to the commencement of any site works. The plan is to detail:
    - Quantity of material to be transported
    - Proposed truck movements per day
    - Proposed hours of operation
    - Proposed traffic routes, noting that 3 tonne load limits apply to some roads within Warriewood Valley

    This plan must be adhered to by all parties associated with the development. No truck movements will be permitted in Garden Street south of Mullet Creek or in Mona Vale Road between Tumbledown Dick and Mona Vale.

BW

13. A stamped copy of the approved plans is to be kept on the site at all times, during construction.

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✓ BW 14. Toilet facilities are to be provided in a location which will not detrimentally affect the amenity of any adjoining residents at or in the vicinity of the work site during the duration of the development.

✓ N/A 15. Where excavations extend below the level of the base of the footings of a building on an adjoining allotment of land, the person causing the excavation must give the owner of the adjoining property at lease seven (7) days written notice of their intention to excavate below the level of the base of the footing and furnish the adjoining property owner with particulars of the proposed work.

✓ BW 16. Contractors and visitors to the site are to be advised of the purpose for the tree/ native vegetation/ habitat protection/exclusion fencing installed in accordance with this consent by the placement of a suitable warning sign on the fence. The sign is to include advice that no works or storage of materials is to take place within the dripline of existing trees.

BW Arborist 17. As excavation is required within five metres of an existing significant tree or trees and vegetation on an adjoining site, the excavation is to be supervised by a qualified consulting arborist. In the event that major structural roots or feeder roots are encountered, the arborist is to require the builder to carry out appropriate action to ensure the retention of the tree or other vegetation, and is to advise the Principal Certifying Authority accordingly. Works are not to progress past this point until the Principal Certifying Authority has confirmed that this condition has been satisfied.

Eng 18. Where tree roots are present, a pier and beam or other method of footing construction is to be implemented, so as to bridge/span major structural or feeder roots. Further, a consulting Structural Engineer is to inspect the site, amend the approved footing details and submit a copy of the amended plans to the Principal Certifying Authority for public records purposes. The amended footing details are to be signed by a qualified practising Structural Engineer with corporate membership of the Institute of Engineers Australia (M.I.E), or who is eligible to become a corporate member and has appropriate experience and competence in the related field, confirming that the plans/details comply with the relevant Building Code of Australia and/or Australian Standards.

✓ 19. During site excavation, topsoil which is to be used in later landscape works is to be stockpiled on site and stabilised during construction works. Stockpiles are to be stored outside of hazard areas and not located within the dripline of existing trees which are to be retained.

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20. The project manager is to erect signs advising all contractors and visitors to the site that no works or storage are to take place within the dripline of existing trees.

21. Tree guards are to be provided around all trees as indicated on Survey Plan Prepared by DP Surveying Services Reference No 1510 dated 14 Aug & 15 Dec 2006, or where after approval of the relevant Construction Certificate Application/s, trees stand within the envelope of approved buildings or within the alignment of approved permanent paved vehicular access roads and parking areas. The tree guards are to be installed prior to the commencement of any work on the site. No works, including utility installations (eg water, sewer, telephone, drainage), are to be undertaken within 4 metres of the trunk of any such trees. The tree guards shall be a minimum 1200mm high at least four (4) metres from the base of the nominated tree/s and constructed from timber posts and rails or posts and suitable plywood panels.

22. Guards or fences are to be provided around native vegetation as identified/ nominated on the approved plans. The guards or fences are to be installed prior to the commencement of any work on the site. No works, including utility installations (eg water, sewer, telephone, drainage), are to be undertaken within 4 metres of the trunk of any such trees. The tree guards shall be a minimum 1200mm high at least four (4) metres from the base of the nominated tree/s and constructed from timber posts and rails or posts and suitable plywood panels.

23. When working within the drip line of the trees, hand digging is to occur in sensitive areas. Liaison on a daily basis is to be maintained during the excavation works between the Builder and Arborist. No filling or compaction shall occur over tree roots within the area defined by the outer drip line of the crown. Root protection/ compaction mitigation in the form of planks or metal decking supported clear of the ground fixed to scaffolding is to be installed as required.

24. No storage of building materials or building waste, excavated fill or topsoil storage is to occur within the dripline of trees shown on the approved landscape working drawing(s) as being retained or within protective fenced areas.

    Drainage is to be arranged such that fill, building materials or contaminants are not washed into protective fenced areas.

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25. The developer or contractor will take all measures to prevent damage to trees and root systems during site works and construction activities including provision of water, sewerage and stormwater drainage services. In particular, works, erection of structures, excavation or changes to soil levels within 5 metres of the trunks of trees to be retained are not permitted unless part of the development as approved, and the storage of spoil, building materials, soils or the driving or parking of any vehicle or machinery within 5 metres of the trunk of a tree to be retained, is not permitted.

    NOTE: Trees that are part of an Endangered Ecological Community or are habitat for threatened species and endangered populations must comply with the requirements of the Threatened Species Conservation Act, 1995. Failure to do so may result in a penalty up to a maximum of $250,000.00 and jail sentences.

    Failure to comply with the requirements of the Pittwater Council Tree Preservation and Management Order may result in a penalty up to a maximum of $20,000.00.

26. All works within 5 metres of the existing trees to be retained including pruning, demolition, excavation, civil works, fencing and the like must be carried out by hand under the supervision of an experienced and qualified Arborist. Should roots larger than 50mm be encountered all excavation works are to cease immediately and a qualified Arborist is to advise on the impacts of the roots removal on the tree's survival and report to the Principal Certifying Authority prior to works recommencing.

    If tree roots are present a pier and beam method of footing construction is to be adopted so as to bridge/span any identified lateral roots.

27. Native plants are to be translocated from the construction area into the bush regeneration / landscape areas by an appropriately qualified person. The Bushland Management Consultant is to certify that plants have been adequately translocated prior to commencement of works.

28. Protection measures are to be installed in accordance with all approved plans including the Arborist Report and /or Ecological Sustainability Plan. Protection measures are to be maintained for the duration of the works.

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E. Matters to be satisfied prior to the issue of Occupation Certificate:

Note: Prior to the issue of an Occupation Certificate the principal certifying authority is to ensure that Council's assets, including road, kerb and gutter and drainage facilities adjacent or near to the site have not been damaged as a result of the works. Where such damage has occurred, it is to be repaired to Council's written satisfaction prior to the issue of an Occupation Certificate or suitable arrangements put in place to affect those repairs at a future date to Council's written satisfaction. Should this process not be followed, Council will pursue action against the principal accredited certifier in relation to the recovery of costs to affect such works.

Note: It is an offence to occupy the building or part thereof to which this consent relates prior to the issue of an Occupation Certificate.

Done ? Sub DA, DA - 1. A positive covenant/ restriction on the use of land is to be created prior to the issue of the Occupation Certificate where the recommendations of the approved Geotechnical Report prepared by Jeffrey and Katauskas requires on-going maintenance / inspections to ensure that the development achieves the acceptable level of risk criteria over the life of the development, the terms of which are to require the landowner to comply with the recommendations contained in that report.

Geotech 2. Prior to issue of the Occupation Certificate, Form 3 of the *Geotechnical Risk Management Policy* is to be completed and submitted to the Principal Certifying Authority.

Arborist 3. Prior to issue of an Occupation Certificate photographic evidence of the condition of the street trees and road reserve and area adjoining the site after the completion of all construction, must be submitted to the Principal Certifying Authority showing that no damage has been done and if damage has been done that it has been fully remediated. The photographs shall be accompanied by a statement that no damage has been done (or where damage has been remediated that Council has approved that work). In this regard Councils written agreement that all restorations have been completed satisfactorily must be obtained prior to the issue of any Occupation Certificate.

BW photos prior + completion 4. Restoration of all damaged public infrastructure caused as a result of the development to Councils satisfaction. Councils written approval that all restorations have been completed satisfactorily must be obtained must be provided to the Private Certifying Authority with the Occupation Certificate application.

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Arch 5. An Occupation Certificate application stating that the development complies with the Development Consent, the requirements of the Building Code of Australia and that a Construction Certificate has been issued must be obtained before the building is occupied or on completion of the construction work approved by this Development Consent.

Byron (Done) 6. A copy of the Section 73 Compliance Certificate issued under the provisions of the Sydney Water Act, 1994, is to be forwarded to Council or the Private Certifying Authority with the Occupation Certificate.

BW 7. All existing and /or proposed dwellings/sole occupancy units are to have approved hard-wired smoke alarms installed and maintained over the life of the development. All hard-wired smoke alarms are to be Australian Standard compliant and must be installed and certified by any appropriately qualified electrician prior to the issue of any Occupation Certificate.

Arch Fire Consultt 8. An Accredited Certifier is to provide a certification to the Private Certifying Authority that the requirements of the NSW Rural Fire Service have been complied with in relation to any potential risk to dwellings or occupants within the development from bushfire in landscaped areas in or adjoining the creekline corridor or other natural bushland areas in or adjoining the site.

BW 9. Street numbers are to be affixed to the building prior to occupation.

Council 10. Address street numbering can only be authorised by Council. Before proceeding to number each lot/occupancy in your development, approval must be sought from Councils Planning and Assessment Business Unit.

Aust Post You are advised to contact Australia Post regarding the required size and location of letterboxes.

Arch 11. Certification is to be provided that the commitments identified in the BASIX Certificate have been fulfilled.

Bushland Consultt 12. Removal of Noxious and Environmental Weeds is to be certified by a Bushland Management Consultant as being complete.

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13. Removal of Noxious and Environmental Weeds is to be certified by the Bushland Management Consultant as being in accordance with approved Ecological Sustainability Plan.

14. The Bushland Management Consultant is to certify that Bushland is in the same (or better condition) post development relative to pre-development except in the location of the approved zone of influence of the development on the site.

F. Matters to be satisfied prior to the issue of Subdivision Certificate:

G. Advice:

1. Portions of the site may be liable to flooding from the 1% AEP and the PMF (Probable Maximum Flood) and effective precautions should be taken by the owner(s) and/or occupier(s) of the building to reduce any potential risk to personal safety and to minimise any property damage to the structure, its fixtures and contents.

2. Failure to comply with the relevant provisions of the Environmental Planning and Assessment Act, 1979 (as amended) and/or the conditions of this Development Consent may result in the serving of penalty notices (on-the-spot fines) under the summary offences provisions of the above legislation or legal action through the Land and Environment Court, again pursuant to the above legislation.

3. The applicant is also advised to contact the various supply and utility authorities, ie Sydney Water, Sydney Electricity, Telstra etc. to enquire whether there are any underground utility services within the proposed excavation area.

4. It is the Project Manager's responsibility to ensure that all of the Component Certificates/certification issued during the course of the project are lodged with the Principal Certifying Authority. Failure to comply with the conditions of approval or lodge the Component Certificates/certification will prevent the Principal Certifying Authority issuing an Occupation Certificate.

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5. In accordance with Section 80A(1)(d) and (e) of the Act, any consent given shall be void if the development to which it refers is not commenced within two (2) years after the date of approval, provided that Council may, if good cause be shown, grant an extension of renewal of such consent beyond such period.

   NOTE: Council may be prepared to consider an extension of this Consent period for a further 12 months, however, the request for extension would have to be received during the initial 2 year period.

6. To ascertain the date upon which the determination becomes effective, refer to Section 83 of the Environmental Planning and Assessment Act, 1979 (as amended).

7. Should any of the determination not be acceptable, you are entitled to request reconsideration under Section 82A of the Environmental Planning and Assessment Act, 1979. Such request to Council must be made in writing, together with appropriate fees as advised at the time of lodgement of such request, within 1 year from the date of determination.

8. If you are dissatisfied with this decision, Section 97 of the Environmental Planning and Assessment Act, 1979, gives you a right of appeal to the Land and Environment Court within 12 months of the date of endorsement of this Consent.

9. The approved plans must be submitted to a Sydney Water Quick Check agent or Customer Centre to determine whether the development will affect Sydney Water's sewer and water mains, stormwater drains and/or easements, and if further requirements need to be met. The approved plans will be appropriately stamped. For Quick Check agent details please refer to the web site at www.sydneywater.com.au then see Building Developing and Plumbing then Quick Check, or telephone 13 20 92.

10. Electrical insect killing light devices should not be outside and not installed anywhere that they can attract and kill micro-bats and killing insects reduces bat food and insects.

BASIX Certificate

Building Sustainability Index www.basix.nsw.gov.au

Certificate number: 141962S

This certificate confirms that the proposed development will meet the NSW government's requirements for sustainability, if it is built in accordance with the commitments set out below. Terms used in this certificate, or in the commitments, have the meaning given by the document entitled "BASIX Definitions" dated 29/06/2006, published by the Department of Planning. This document is available at www.basix.nsw.gov.au

Director-General
Date of issue: Friday, 08 June 2007

NSW GOVERNMENT
Department of Planning

Score

- ✓ Water: 50 (Target 40)
- ✓ Thermal comfort: pass (Target pass)
- ✓ Energy: 43 (Target 40)

Description of project

Project address	
Project name	100A Wakehurst
Street address	100A Wakehurst Parkway Elanora Heights 2101
Local Government Area	Pittwater Council
Plan type and plan number	Deposited Plan 13152
Lot no.	123
Section no.	0.0
Project type	
Project type	separate dwelling house
No. of bedrooms	3
Site details	
Site area (m²)	1299
Roof area (m²)	90
Conditioned floor area (m2)	167
Unconditioned floor area (m2)	14
Total area of garden and lawn (m2)	50
Assessor details and thermal loads	
Assessor number	n/a
Certificate number	n/a
Cooling load (MJ/m².year)	n/a
Heating load (MJ/m².year)	n/a
Other	
none	n/a

Schedule of BASIX commitments

The commitments set out below regulate how the proposed development is to be carried out. It is a condition of any development consent granted, or complying development certificate issued, for the proposed development, that BASIX commitments be complied with.

Water Commitments	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
Landscape			
The applicant must plant indigenous or low water use species of vegetation throughout 30 square metres of the site.	✓	✓	
Fixtures			
The applicant must install showerheads with a minimum rating of 3 star in all showers in the development.		✓	✓
The applicant must install a toilet flushing system with a minimum rating of 4 star in each toilet in the development.		✓	✓
The applicant must install taps with a minimum rating of 6 star in the kitchen in the development.		✓	
The applicant must install basin taps with a minimum rating of 6 star in each bathroom in the development.		✓	
Alternative water			
Rainwater tank			
The applicant must install a rainwater tank of at least 7000 litres on the site. This rainwater tank must meet, and be installed in accordance with, the requirements of all applicable regulatory authorities.	✓	✓	✓
The applicant must configure the rainwater tank to collect rain runoff from at least 75 square metres of the roof area of the development (excluding the area of the roof which drains to any stormwater tank or private dam).		✓	✓
The applicant must connect the rainwater tank to:			
• all toilets in the development		✓	✓
• the cold water tap that supplies each clothes washer in the development		✓	✓
• at least one outdoor tap in the development (Note: NSWHealth does not recommend that rainwater be used for human consumption in areas with potable water supply.)		✓	✓

Thermal Comfort Commitments	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
Floor, walls and ceiling/roof			
The applicant must construct the floor(s), walls, and ceiling/roof of the dwelling in accordance with the specifications listed in the table below.	✓	✓	✓

Construction	Additional insulation required (R-Value)	Other specifications
floor - suspended floor above enclosed subfloor, framed	0.6 (or 1.3 including construction) (down)	site slope > 10% below floor
external wall - framed (weatherboard, fibro, metal clad)	1.30 (or 1.70 including construction)	
ceiling and roof - raked ceiling / pitched or skillion roof, framed	ceiling: 2.24 (up), roof: foil backed blanket (55mm)	framed; medium (solar absorptance 0.475-0.70)
ceiling and roof - flat ceiling / flat roof, framed	ceiling: 2.08 (up), roof: foil backed blanket (55mm)	framed; medium (solar absorptance 0.475-0.70)

Thermal Comfort Commitments	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
Windows, glazed doors and skylights			
The applicant must install the windows, glazed doors and shading devices described in the table below, in accordance with the specifications listed in the table. Relevant overshadowing specifications must be satisfied for each window and glazed door.	✓	✓	✓
The dwelling may have 1 skylight (<0.7 square metres) and up to 2 windows/glazed doors (<0.7 square metres) which are not listed in the table.	✓	✓	✓
The following requirements must also be satisfied in relation to each window and glazed door:	✓	✓	✓
• Except where the glass is 'single clear' or 'single toned', each window and glazed door must have a U-value no greater than that listed and a Solar Heat Gain Coefficient (SHGC) +/-10% of that listed. Total system U-values and SHGC must be calculated in accordance with National Fenestration Rating Council (NFRC) conditions.			✓
• The leading edge of each eave, pergola, verandah, balcony or awning must be no more than 500 millimetres above the head of the window or glazed door, except that a projection greater than 500 mm and up to 1500 mm above the head must be twice the value in the table.	✓	✓	✓
• Pergolas with polycarbonate roof or similar translucent material must have a shading coefficient of less than 0.35.		✓	✓
• Unless they have adjustable shading, pergolas must have fixed battens parallel to the window or glazed door above which they are situated, unless the pergola also shades a perpendicular window. The spacing between battens must not be more than 50 mm.		✓	✓
• Overshadowing buildings/vegetation must be of the height and distance from the centre and the base of the window and glazed door, as specified in the 'overshadowing' column.	✓	✓	✓

Window/glazed door no.	Orientation	Maximum area (square metres)	Type	Shading	Overshadowing
W1	N	4.2	timber or uPVC, single toned (or U-value:5.67, SHGC:0.49)	eave/verandah/pergola/balcony 601-750 mm	not overshadowed
W2	N	12.6	timber or uPVC, single clear (or U-value:5.71, SHGC:0.66)	eave/verandah/pergola/balcony 601-750 mm	2-4m high, 2-5 m away
W3	N	10.56	timber or uPVC, toned/air gap/clear (U-value:3.64, SHGC:0.42)	eave/verandah/pergola/balcony 601-750 mm	not overshadowed
W4	S	31.68	timber or uPVC, clear/air gap/clear (U-value:3.67, SHGC:0.59)	none	not overshadowed
W5	E	6.5	timber or uPVC, clear/air gap/clear (U-value:3.67, SHGC:0.59)	eave/verandah/pergola/balcony 751-900 mm	not overshadowed

Window/glazed door no.	Orientation	Maximum area (square metres)	Type	Shading	Overshadowing
W6	W	17.28	timber or uPVC, toned/air gap/clear (U-value:3.64, SHGC:0.42)	eave/verandah/pergola/balcony 751-900 mm	not overshadowed
W7	S	7.38	timber or uPVC, clear/air gap/clear (U-value:3.67, SHGC:0.59)	none	not overshadowed
W8	N	2.46	timber or uPVC, single clear (or U-value:5.71, SHGC:0.66)	eave/verandah/pergola/balcony 601-750 mm	not overshadowed
W9	N	4.2	timber or uPVC, single toned (or U-value:5.67, SHGC:0.49)	eave/verandah/pergola/balcony 601-750 mm	not overshadowed
W10	N	12.6	timber or uPVC, single clear (or U-value:5.71, SHGC:0.66)	eave/verandah/pergola/balcony 601-750 mm	2-4m high, 2-5 m away

Thermal Comfort Commitments	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
Cross ventilation			
The commitment below applies to the following rooms or areas of a dwelling which comprise a breeze path for the dwelling: • Breeze path 1: within main living area • Breeze path 2: within Bedroom 1 (not ensuite) • Breeze path 3: Bedroom 2 to other space (not separate bathroom) • Breeze path 4: Bedroom 3 to other space (not separate bathroom)	✓	✓	✓
The applicant must construct the dwelling so that at least 1 ventilation opening is provided in each such room or area. (If only 1 room or area of a dwelling is mentioned for a breeze path, then that room or area must have at least 2 ventilation openings).	✓	✓	✓
The 2 ventilation openings must be located as follows: • Breeze path 1: opposite external walls • Breeze path 2: >3 m apart and on adjacent external walls • Breeze path 3: >3 m apart and on adjacent external walls • Breeze path 4: >3 m apart and on adjacent external walls	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓
The 2 ventilation openings must meet the following specifications: (a) not be more than 15 metres apart; (b) be at least 1 square metre in size; and (c) have only 1 doorway, or opening less than 2 square metres in size, located in the direct path between them.	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓

Energy Commitments	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
Hot water			
The applicant must install the following hot water system in the development, or a system with a higher energy rating, or a system with a higher energy rating: gas instantaneous - 5 Star	✓	✓	✓
Cooling system			
The living areas must not incorporate any cooling system, or any ducting which is designed to accommodate a cooling system.		✓	✓
The bedrooms must not incorporate any cooling system, or any ducting which is designed to accommodate a cooling system.		✓	✓
Heating system			
The living areas must not incorporate any heating system, or any ducting which is designed to accommodate a heating system.		✓	✓
The bedrooms must not incorporate any heating system, or any ducting which is designed to accommodate a heating system.		✓	✓
Ventilation			
The applicant must install the following exhaust systems in the development: At least 1 Bathroom: no mechanical ventilation (ie. natural); Operation control: n/a		✓	✓
Kitchen: individual fan, ducted to façade or roof; Operation control: manual switch on/off		✓	✓
Laundry: natural ventilation only, or no laundry; Operation control: n/a		✓	✓
Artificial lighting			
The applicant must ensure that the "primary type of artificial lighting" is fluorescent or light emitting diode (LED) lighting in each of the following rooms, and where the word "dedicated" appears, the fittings for those lights must only be capable of accepting fluorescent or light emitting diode (LED) lamps: • at least 3 of the bedrooms / study;		✓	✓
• at least 1 of the living / dining rooms;		✓	✓
Natural lighting			
The applicant must install a window and/or skylight in the kitchen of the dwelling for natural lighting.	✓	✓	✓
The applicant must install a window and/or skylight in 3 bathroom(s)/toilet(s) in the development for natural lighting.	✓	✓	✓

Energy Commitments		Show on DA plans		Show on CC/CDC plans & specs	Certifier check
Other					
The applicant must install a gas cooktop & electric oven in the kitchen of the dwelling.				✓	
The applicant must install a fixed outdoor clothes drying line as part of the development.				✓	
The applicant must install a fixed indoor or sheltered clothes drying line as part of the development.				✓	

Legend
In these commitments, "applicant" means the person carrying out the development.
Commitments identified with a ✓ in the "Show on DA plans" column must be shown on the plans accompanying the development application for the proposed development (if a development application is to be lodged for the proposed development).
Commitments identified with a ✓ in the "Show on CC/CDC plans and specs" column must be shown in the plans and specifications accompanying the application for a construction certificate / complying development certificate for the proposed development.
Commitments identified with a ✓ in the "Certifier check" column must be certified by a certifying authority as having been fulfilled, before a final occupation certificate(either interim or final) for the development may be issued.

DOCHERTY
CONSULTING
ENGINEERS
Structural and Civil

11 April 2012

Our Ref: 91007C1

Civil/Structural Engineer's Certificate
Completed Driveway Works

Subdivision of Lot 123 in D.P.13152
100 Wakehurst Parkway, Elanora Heights

We hereby certify that the driveway for the abovementioned property has been constructed in accordance with the approved design drawings and relevant conditions of development consent.

We have issued the following drawings covered by this certification:

- 91007S01 Rev 0 Structural details;
- 91007SK1 Rev 1 West boundary retaining wall.

The access driveway complies with Pittwater Council 21 DCP Control B6.1

Yours faithfully,
Docherty Consulting Engineers Pty Ltd

K R Docherty
BE(Civil) ME(Struct) PEng
Director

Waddington Consulting Pty Ltd
ACN 130 522 851
Structural and Civil Engineering
Suite 506, Level 5
22 Central Ave, Manly
P.O. Box 1044
Manly NSW 1655

P (02) 9976 0070
F (02) 9976 0095

6 July 2010

Bauen Constructions
c/o Mike Foran Architetcure
PO Box 417
Manly NSW 1655

Dear Sir,

Subject: Proposed New Dwelling at 100A Wakehurst Parkway, Elanora Heights
Certification of Stormwater Management and Erosion and Sediment Management Plans

Please find attached the *Stormwater Management Plan* (drawings 9234-C1.00 and C1.01, Rev A dated 6 July 2010) and *Erosion and Sediment Control Plan* (drawings 9234-C2.00, C2.01 and C2.02, Rev A dated 6 July 2010) in support of your Construction Certificate for the proposed new dwelling at 100A Wakehurst Parkway, Elanora Heights.

I certify that the *Stormwater Management Plan* and the *Erosion and Sediment Control Plan* have been prepared in accordance with the requirements of Pittwater Council's Development Consent N0352/07, dated 20 December 2007. Additionally, the plan and details shown in the *Erosion and Sediment Control Plan* have been designed in accordance with the NSW Department of Land and Water Conservation's *Urban Erosion and Sediment Control* manual.

Details and locations of all intercept drains, disposal of collected surface water and reference to the geotechnical report for procedures for excavation and retention of cuts is included on the *Erosion and Sediment Control Plan.*

Please do not hesitate to contact us if you have any queries regarding either of these plans.

Yours sincerely,

K Waddington

Kate Waddington
BE (Civil) MEngSci (Water Resources)
CPEng MIEAust NPER (Civil)

This Report has been prepared and submitted by R Coffey, FPA Australia, Certified Practitioner
Practitioner Certification No-PBD-PA-09328

Fire Base Consulting

FPA AUSTRALIA
Certified Business
Bushfire Planning & Design

Building Construction in Bush Fire Prone Areas

Bushfire Risk Assessment

In relation to

Proposed Development at

No 100 Wakehurst Parkway, Elanora Heights

Prepared on behalf of

Jason Bennet

11th March 2007

Reference No – 452

Contents:

Introduction

This report has been commissioned by Mike Foran Architecture on behalf of Jason Bennet to provide a bushfire risk assessment for the subdivision of one lot into two at 100 Wakehurst Parkway Elanora Heights.

This report includes an assessment of:

- A one into two lot subdivision;
- The construction of proposed new class 1A dwelling;
- The construction of proposed new double garage on each of the two lots;
- Alterations and additions to the existing dwelling on the site;
- A new right of carriageway with turning bays; and
- Extensive landscaping.

The proposed development site has been identified as being on bush fire prone land, and the legislative requirements for building in bushfire prone lands are applicable. This report has been prepared in accordance with the requirements of Clause 46 of the Rural Fire Service Regulation 2002 for the purpose of section 100B of the Rural Fires and Environmental Assessment Legislation Amendment Act 2002 No 67.

This assessment includes an analysis of the hazard, threat and subsequent risk to the development proposal and provides recommendations that satisfy the Objectives and Performance requirements of the Building Code of Australia, Planning for Bushfire Protection and Australian Standard AS3959, 1999.

Throughout this report reference is made to properties No 104 and 106 Wakehurst Parkway and 1 Elanora Road which have recently applied for one into two lot subdivisions. Approval has been granted on each of these applications and work has commenced. These lots are neighboring properties west of the subject site.

1) Description of the Subject Property including:

a) Description

The development site is a residential site facing south onto the Wakehurst Parkway. There is an existing class 1A dwelling on the site located towards the front southern boundary.

The following sections 5-9 describe in detail the vegetation, slope, access and egress, availability of water supplies and environmental considerations for the site.

b) Location

No 100 Wakehurst Parkway, Elanora Heights

UBD Reference: Page 158 Reference A2

Lot 123, DP 13152

LGA - Pittwater

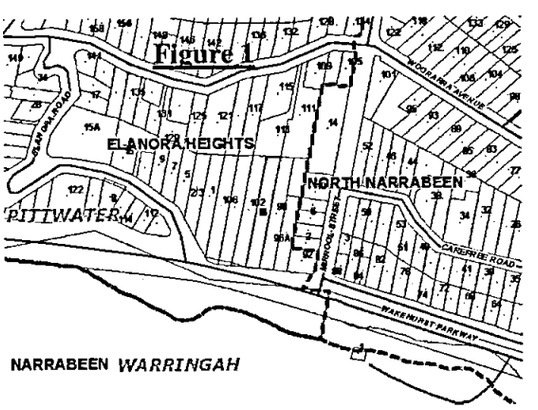


Figure 1

b) Zoning of Proposed Development Site and Adjoining Properties

The site is zoned residential.

Properties adjoining the north, east and west boundaries are similarly zoned residential. South across the Wakehurst Parkway is Narrabeen Lakes Foreshore Reserve and further to the west is Garigal National Park.

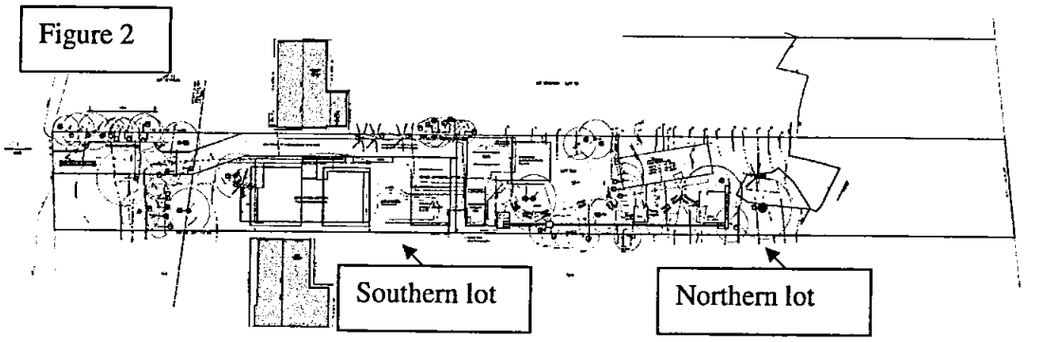
c) Development Proposal and Building Classifications

The proposal is for:

- A one into two lot subdivision;
- The construction of proposed new class 1A dwelling on the rear northern lot;
- The construction of proposed new double garage on each of the two lots;
- Alterations and additions to the existing dwelling on the site;
- A new right of carriageway with turning bays; and
- Extensive landscaping.

The following image is a site plan showing the layout of the development proposal.

Figure 2



The images below are the bushfire prone land map for the area, the vegetation structure across Wakehurst Parkway and an aerial photograph which shows the proximity of the subject site to the hazards.

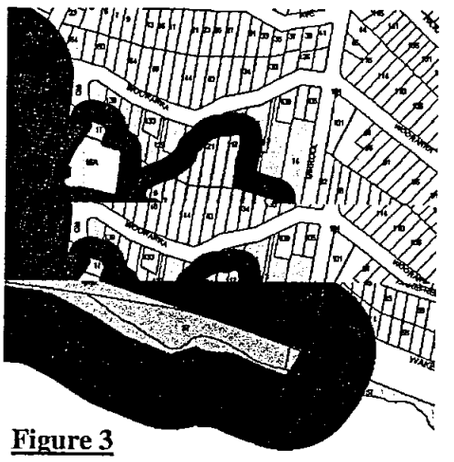


Figure 3

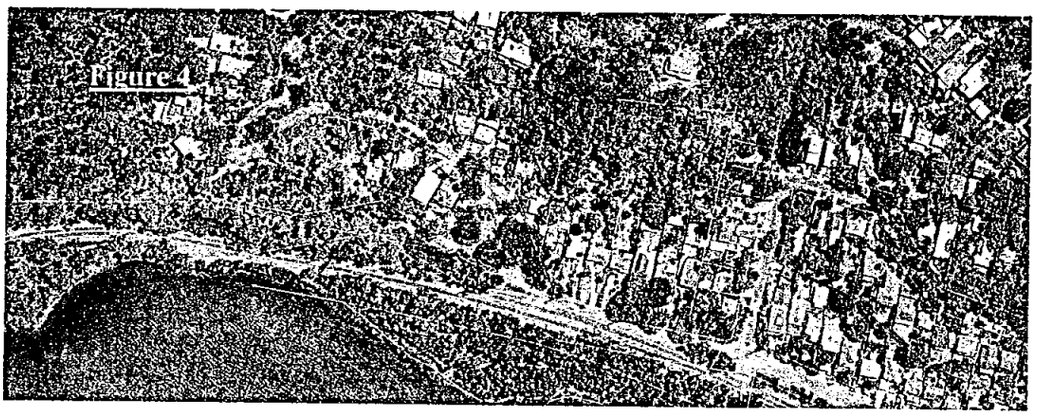


Figure 4

2) Classification of the Vegetation on and surrounding the Site

The site is effectively divided into sections. From the front southern boundary to a cliff face, approximately 30m from the rear north boundary, the site has been managed and maintained and there is no threat from bushfire attack in this area. Above the cliff top there is an area of bushland that is shown on the Bushfire Prone Land Map as a remnant area of vegetation. This bushland area is owned by, and is under the control and management of the owner/developer.

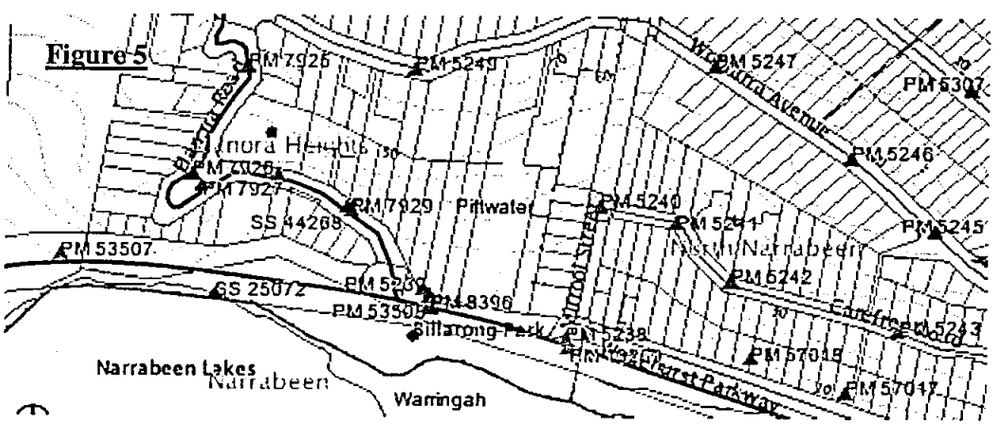
- North; the northern boundary adjoins privately owned residential sites which are partially managed and include a portion of the remnant bushland previously discussed.
- South; the southern boundary adjoins the Wakehurst Parkway across which is a strip of waterfront reserve approximately 30-40m wide. The vegetation is predominantly casuarinas with a few scattered eucalypts 10-15m high, 50% canopy, with immature casuarinas, lantana, privet and wattles as an understorey and ground cover of grasses and ferns. This area of bushland is less than 40m wide and for the purpose of this assessment is considered not capable of supporting a substantial run of fire.
- East; the eastern boundary of the subject site adjoins developed and managed properties and there is no threat of bushfire attack from this direction.
- West; the western boundary adjoins developed sites. No's 104 and 106 Wakehurst Parkway have been approved for subdivision and the construction of four new dwellings has begun. The next property to the west, 1 Elanora Road, has been approved for subdivision and there is an existing dwelling on the site. Work has not commenced on the subdivision and construction of the proposed new dwellings.

  Further to the west is Garigal National Park. There is no continuity of canopy or understorey from this park and the nearest point of the hazard is more than 140m from the subject site. For the purpose of this assessment the category of bushfire attack from this direction is considered 'Low'.

3) Assessment of Slope on and surrounding the Site

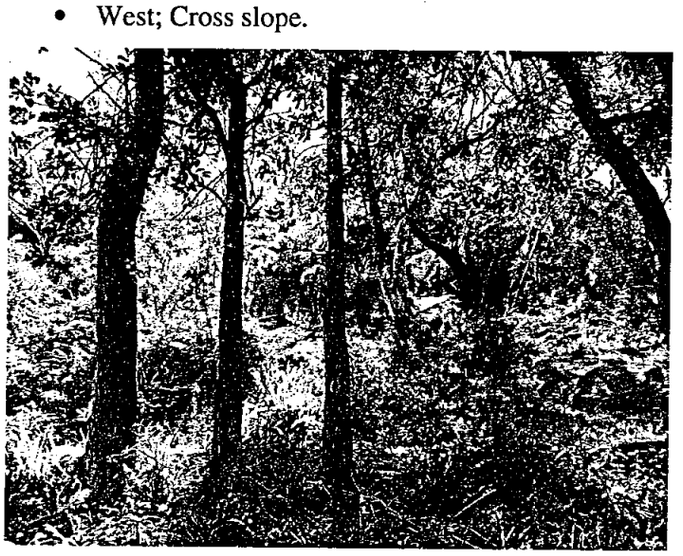
The site slopes upslope from south to north at approximately 5-6 degrees to 30m from the rear northern boundary. At this point there is a 20m vertical escarpment up to the rear northern section of the site where the slope is then less than 5 degrees upslope to the north. The photograph below shows part of the escarpment. The slope across the site from east to west is level. [Cross slope]

Figure 5



Slope away from the development site:

- North; 5-10 degrees upslope
- South; <5 degrees downslope;
- East; Cross slope;
- West; Cross slope.



4) Identification of Significant Environment Features

The rock features on the site could be considered significant and the proposal will not include the removal or alteration of any of these natural features. The proposal is specifically designed to include the escarpment and rock formations in the landscaping. A Geotechnical Report has been provided which is available with the development application.

5) Threatened Species Identification

A flora and fauna survey has been requested by Pittwater Council and the findings of that survey provide information that the proposed development and landscaping will have no adverse effect on the environment.

The report is available with the development application.

A Statement of Environmental Effects will be submitted with the development application.

6) Aboriginal Relic or Place detail and Location known to exist on the property

There is no known Aboriginal Relic or Place known to exist on the site.

7) Bushfire Risk Assessment

7a) the extent to which the development is to provide for setbacks, including Asset Protection Zones

The following tables are based on the information provided in PBP which recognises that: *Remnant vegetation is a parcel of vegetation with a size of less than 1ha or a shape that provides a potential fire run directly towards buildings not exceeding 50m. These remnants are considered a 'low' hazard, setbacks and building construction standards for these will be the same as for rainforests. The effective slope is to be determined over the length of the remnant. [Refer to section 2 of this report for a comprehensive description of the hazards to the north and south of the subject site]*

Table 1; Reference to 'Planning for Bushfire Protection 2006' Table A2.4
Minimum Specifications for Asset Protection Zones for residential developments

Direction	Distance of asset protection zone	Vegetation classification	Assessment of slope away from the development [Effective slope]	Required asset protection zone with reference to Table A2.3
North	>30m	Remnant	5-10 degrees upslope initially then almost vertical for >20m	10m
South	52m from the southern most elevation of the front southern dwelling	Remnant	<5 degrees downslope	10m
East	140m	Developed sites	Cross slope [Level]	10m
West	>140m	Developed sites then Forest	Cross slope [Level]	10m
Summary: On-site asset protection can be provided in excess of the requirements of Table A2.4 of PBP				

Table 2; Reference PBP Table A3.3
Determination of Category of Bushfire Attack for the existing dwelling on the site [southern lot] and subsequent required building standards

Direction	Distance of Asset Protection Zone	Vegetation Classification	Assessment of Slope away from the development	Category of Bushfire Attack for the Site	Construction Standard Required
North	>70m	Remnant	5-10 degrees upslope initially then almost vertical for >20m	Low	Standard BCA Requirements
South	52m from the southern most elevation to the hazard across	Remnant	<5 degrees downslope	Low	Standard BCA Requirements
East	>140m	Developed sites	Cross slope [Level]	Low	Standard BCA Requirements
West	>140m	Developed sites then Forest	Cross slope [Level]	Low	Standard BCA Requirements
Summary: Based upon the relevant provisions of PBP the category of bushfire attack is for the site is 'Low' and the subsequent minimum construction standard is 'Standard BCA Requirements'. Research has shown that the majority of homes destroyed or damaged from bushfires are as a result of ignition from ember attack. The Rural Fire Service has therefore concluded that dwellings within the buffer zone for a bushfire hazard should be designed and built to a minimum of 'Level 1' construction standard AS3959, 1999 for the 'medium' level of bushfire attack.					

Table 3; Reference PBP Appendix 3, Table A3.3
Determination of Category of Bushfire Attack for the proposed new dwelling on the northern section of the subject site and subsequent required building standards

Direction	Distance of Asset Protection Zone	Vegetation Classification	Assessment of Slope away from the development	Category of Bushfire Attack for the Site	Construction Standard Required
North	>30m	Remnant	5-10 degrees upslope initially then almost vertical for >20m	Medium	Level 1 AS3959
South	52m from the southern most elevation to the hazard across	Remnant	<5 degrees downslope	Low	Standard BCA Requirements
East	>140m	Developed sites	Cross slope [Level]	Low	Standard BCA Requirements
West	>140m	Developed sites then Forest	Cross slope [Level]	Low	Standard BCA Requirements
Summary: Based upon the relevant provisions of PBP the category of bushfire attack is for the site is 'Medium' and the subsequent minimum construction standard is Level 1 AS3959, 1999.					

7b) Siting and adequacy of water supplies for fire fighting

The area has reticulated water supply and the nearest street hydrant is 20m from the front boundary of the subject site. The nearest street hydrant is greater than 90m from the most distant point of the proposed rear dwelling on the northern section of the site. This report will include recommendations that a water supply reserve dedicated to protection from bushfire attack shall be provided and permanently available.

7c) the capacity of public roads in the vicinity to handle increased volume of traffic in an emergency

The public road system for the area has been well designed and maintained and appears adequate for an increased volume of traffic.

7d) Whether or not public roads in the vicinity that link with the fire trail network have two-way access

Fire trails in the vicinity link with the public road system but this is not an issue as the subject site has direct access to public roads.

7e) the adequacy of arrangements for access to and egress from the development site for the purpose of an emergency response

Property access has been provided by the proposal to construct a new access driveway along the western boundary of the subject site.

The proposed driveway is 3.5m wide at the narrowest point. This width does not conform to the 'Acceptable solution' requirement of PBP for access driveways, however;

- The access driveway is less than 50m in length;
- There is a wide parking area provided adjacent to the double garage on the southern lot which allows adequate passing;
- There is a 'hammerhead' turning area provided adjacent to the double garage on the northern lot at the end of the access driveway;
- The proposal includes the installation of a wide hard stand area adjacent to the front southern boundary of the subject site which is appropriate for off street parking of fire fighting vehicles and still allows adequate passing width at the entrance to the subject site from the Wakehurst Parkway;
- The subdivisions at No's 104 &106 The Wakehurst Parkway and 1 Elanora Road have access driveways approved subject to the above design criteria.

7f) the adequacy of bushfire maintenance plans and fire emergency procedures for the development site

This report shall include recommendations that the entire of the site from the front southern boundary up to and including the escarpment towards the rear northern boundary shall be established and maintained in accordance with inner protection area requirements of PBP.

The bushland area above the escarpment is subject to a flora and fauna study. Hazard reduction of this section of the subject site shall be in accordance with the recommendations of this study cognizant of bio-diversity thresholds.
Fire emergency procedures for the site include the provision of adequate water supplies for fire fighting, access and defendable space for firefighters and equipment and an adequate egress path for emergency evacuation.

7g) the construction standards to be used for building elements in the development

Construction standards have been determined in accordance with the requirements of PBP Appendix 3, Table A3.3. This report shall include recommendations that the proposed new dwelling, the alterations and additions to the existing dwelling and the proposed garages are constructed to the minimum standard of Level 1 AS3959, 1999. [Refer Table 2 & 3 of this report]

7h) the adequacy of sprinkler systems and other fire protection measures to be incorporated into the development

Sprinkler systems are not recommended. The fire protection measures for this development are:

- The establishment and maintenance of asset protection zones in accordance with requirements of PBP;
- Minimum construction standards in accordance with the requirements of *AS3959, 1999 Construction of buildings in bushfire Prone Areas* and Table A3.3 of PBP [refer table 2 & 3 of this report];
- Adequate water supplies [refer section 7b of this report];
- Access and egress to both dwellings that provides suitable access for fire management purposes. [Refer section 7e of this report]

8) Assessment of the extent to which the development proposal conforms or deviates from the specifications set out in Chapter 4 of Planning for Bushfire Protection

The development proposal shall be designed and built to BCA requirements. Considering the findings of the site inspection, with regards category of bushfire attack and required construction standards, the proposed subdivision of one lot into two, the proposed new dwelling on the newly created northern lot and the proposed alterations and additions to the existing dwelling conforms to the requirements of PBP in relation to:

- *Asset Protection Zones*: Defendable space is provided on site. Asset protection zones are fully provided on site to the north and south and by adjoining development to the east and west.
- *Siting and Design*: The buildings have been sited to minimise the risk of bushfire attack and to provide minimal disturbance of the natural rock features on the site.
- *Construction Standards*: The construction standards have been determined in accordance with Appendix 3 of PBP and the requirements for garages in excess of the minimum requirements of PBP.
- *Access Requirements*: The access and egress requirements have been designed to provide safe and effective evacuation from the subject site and to provide effective access for fire brigade personnel and fire fighting equipment.
- *Water Supplies*: The nearest street hydrant is greater than 90m from the most distant point of the proposed rear dwelling on the northern section of the site. This report will include recommendations that a water supply reserve dedicated to protection from bushfire attack shall be provided and permanently available.
- *Landscaping*: The development application shall include recommendations that the site is landscaped and managed to minimise flame contact and radiant heat to the building.

9) Recommendations

The following recommendations are made for the bushfire protection measures for the proposed residential development of a one into two lot subdivision, the construction of a new class 1A dwelling on the northern lot, additions and alterations to the existing dwelling on the southern lot and the construction of a new garage on each lot at 100 Wakehurst Parkway Elanora Heights and are based upon the relevant provisions of the NSW Rural Fire Service guideline entitled *Planning for Bushfire Protection 2006.*

1) The proposed new dwelling on the rear northern lot and the additions and alterations to the existing dwelling on the southern lot shall be constructed to a minimum standard of Level 1 AS3959, 1999;
2) Gutter guards that comply with the specifications of AS3959 shall be installed to prevent the build up of debris in the valleys gutters and downpipes;
3) An unobstructed access pathway should be provided to allow permanent clear access to the rear northern section of the site, below the escarpment, 30m from the rear northern boundary;
4) In recognition that reticulated water supply is available, but the nearest hydrant is not within 90m of the most distant point of the proposed new dwelling, a 5,000 litre dedicated water supply tank and a minimum of 3kW (5hp) petrol or diesel powered pump shall be provided for bushfire protection of the proposed new dwelling on the northern lot. A 65mm storz fitting and ball or gate valve shall be installed in the tank.
5) The entire site from the front southern boundary to the top of the escarpment, approximately 30m from the rear northern boundary, is to be established and maintained as an Inner Protection Area for the purposes of *Planning for Bushfire Protection 2006.*
6) The proposed access driveway, hard stand area adjacent to the southern boundary and turning area at the northern end of the road shall be constructed in accordance with the proposed site plan. [For a description of this access way refer to 7e) of this report]

7) All new fencing and gates shall be constructed in accordance with the NSW Rural Fire Service guideline: *Fast Fact – Fences or Gates in Bushfire Prone Areas;* [Refer section 15 of this report]

8) The development proposal includes the construction of a new garage on each of the two newly created lots.

   The proposed garages:

   - Do not compromise the integrity of the asset protection zones of the subject site,
   - Comply with the requirements of the BCA, section 3.7.1.6 for Fire Separation of class 1a and 10a buildings.
   - Are within 10m of the proposed new dwelling on the northern lot and the existing dwelling on the southern lot and to comply with the requirements of NSW RFS Development Control Note 05 the proposed garages shall be constructed of to a minimum standard of Level 1 AS3959, 1999 for the medium category of bushfire attack;
   - The garage door seals shall be fitted with a suitable protection device to inhibit the entry of embers when the door is closed.

10) Summary

This report consists of a bushfire risk assessment for the proposed residential development of a one into two lot subdivision, the construction of a new class 1A dwelling on the northern lot, additions and alterations to the existing dwelling on the southern lot and the construction of a new garage on each lot at 100 Wakehurst Parkway Elanora Heights.

The report concludes that the development could be subject to a threat from bushfire attack and the legislative requirements for development in bushfire prone areas are applicable.

This report has considered all of the elements of bushfire attack and the compensation measures listed are only of value and capable of providing the required protection from bushfire attack if they are considered as a complete package.

Provided the proposed development is constructed in accordance with the recommendations included in section 9 of this report, it is my considered opinion that the development satisfies the Objectives and Performance requirements of the *Building Code of Australia, Planning for Bushfire Protection 2006 and Australian Standard AS3959, 1999.*

Not withstanding the precautions adopted, it should always be remembered that bushfires burn under a wide range of conditions and an element of risk, no matter how small always remains, and although the standard is designed to improve the performance of such buildings, there can be no guarantee, because of the variable nature of bushfires, that any one building will withstand bushfire attack on every occasion.

Ron Coffey Director, Fire Base Consulting Pty Ltd
Grad I Fire E [Institute of Fire Engineers - 1973]
Grad Cert Fire Safety Eng [UWS - 2003]
Grad Dip Building in Bushfire Prone Areas [UWS – 2005]
Associate Professional Cert in Expert Evidence for LEC
Member - Institute of Fire Engineers
Corporate Member - Fire Protection Association Australia

FPA AUSTRALIA
Certified Business
Bushfire Planning & Design

Ron Coffey
Fire Base Consulting
Fire Protection Association of Australia BPAD-A Certified Practitioner
Certification No BPD-PA09328
02 99137907 0408220443

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11) References

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NSW Government Printer

Planning NSW [2006]
Planning for Bushfire Protection 2006
A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners

Ramsay C & Rudolph L [2003]
Landscape and Building Design for Bushfire Prone Areas
CSIRO Publishing

Standards Australia [1999]
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Australian Building Code Board
Second Edition 1999, amended 2001

Warrington Fire Research [2002]
Literature Review of Bushfire Construction Materials and Proposed Test Protocols for Performance Assessment
WFRA Project No. 20551
Report Version 1.1
11th February 2002

12) Further Readings

Standards Australia can provide a complete version of AS 3959-1999 *Construction of Buildings in bushfire prone areas* and this can be accessed from their website: http://www.standards.org.au/

The NSW Rural Fire Service provides a list of publications that can be accessed from their website. The list below can be used as a guide and the website can be accessed as follows: http://www.bushfire.nsw.gov.au/
Go to "Law and Policy- Australian Standards' to see an abridged version of AS3959
Go to 'Building in Bushfire Prone Areas' and scroll down the page to 'Access Publications....'
All of the items listed below are in the 'Publications' section.

Building in a Bushfire Prone Area
Bush fire prone lands are generally those forest or grasslands that, by virtue of their bushfire hazard and proximity to existing and proposed development, hold a significant risk to property in the event of a bushfire.

Planning for Bushfire Protection 2001 (This document is essential reading)
This document provides the necessary planning considerations when developing areas for residential use in residential, rural residential, rural and urban areas when development sites are in close proximity to areas likely to be affected by bushfire events.

Development Control Note 02 - Establishment of Easements for the purposes of Asset Protection Zones
This Development Control Note aims to provide guidance for the establishment of easements under section 88B or 88D of the Conveyancing Act 1919 for the purpose of providing Asset Protection Zones (APZ) on the adjoining land arising from a proposed development requiring a bush fire safety authority.

Development Control Note 01 - Fire Retardant Timber
This Development Control Note provides a guide for the use of fire-retardant-treated timber for the various levels of construction under Australian Standard AS3959 1999 Construction of Buildings on Bushfire Prone Areas and Planning for Bushfire Protection 2001(PBP).

Development Control Practice Notes 02/2006 Fire Retardant Timber
This practice note supplements Development Control Note 01 regarding the RFS position on fire retardant timber.

Development Control Practice Notes 03/2006 French and Bi-fold doors
The purpose of this practice note is to provide performance criteria for French and Bi-fold doors in bush fire prone areas, Standard French and Bi-fold doors do not meet the requirements of Australian Standard 3959.

Fast Fact - Intumescent Paint Systems
This fact sheet clarifies the RFS position on use of intumescent paint systems which can be used as a performance solution for Level 3 construction.

Fast Fact - Dual Occupancy Developments
This Fast Fact sheet provides information on dual and multiple occupancy developments.

Fast Fact - Construction Levels
This Fast Fact clarifies the RFS position on varying construction levels for 79BA applications.

Fast Fact - Fences or Gates in Bush Fire Prone Areas
This fast fact provides advice on the RFS position for dividing fences in Bushfire prone areas.

Fast Fact - Swimming Pools as a Water Supply
This fast fact clarifies the RFS position on swimming pools as a water supply.

Vegetation and Habitat Assessment Landscape and Ecological Sustainability Concept Plan

100 Wakehust Parkway Elanora Heights

Report Prepared by Julia Stanton MAABR, MAIH, MISA
Syncarpia Vegetation Management
P.O Box 294 Church Point 2105
Fax:99731649 Mob:0403074075
May 2007

Table of Contents

1.0 Introduction

This report has been prepared to accompany a development application for Lot 123 D.P. 113152 100 Wakehurst Parkway Elanora Heights.

The development proposal includes subdivision of the existing lot into two lots, additions and alterations to the existing dwelling, new double garage on each lot and a proposed new residence on the rear lot.

This report is a vegetation and habitat assessment, development impact assessment, and Landscape and Ecological Sustainability Concept Plan (refer to LESCP Figure 1 Appendix) and includes:

- An overview and map of existing indigenous vegetation and weed invasion;
- A site plan identifying the proposed building envelope;
- A photographic record of existing trees, vegetation and site conditions;
- Details of exclusion fencing required prior to commencement of construction works;
- Identification of suitable material and topsoil storage areas;
- Identification of bushland vegetation suitable for regeneration;
- Identification of area suitable for planting;
- Identification of noxious and environmental weeds;
- A weed control / regeneration/ restoration plan;
- Indicative Planting Schedules for proposed landscape areas;
- Indigenous species suitable for revegetation where required;
- Recommendations to address identified development controls;
- Recommendations for tree and vegetation management to minimise the impact of the proposed development on indigenous flora and fauna; and
- Details for the protection and management of existing trees and vegetation to be retained, from the potential adverse impacts arising from the proposed construction activities.

2.0 Methodology

The aim of this report was to survey and assess existing vegetation and potential habitat for indigenous fauna, to develop a Landscape / Ecological Sustainability Concept Plan for the site, and to provide recommendations to mimimise the impact of the proposed development on indigenous flora and fauna.

A preliminary site meeting was held with the applicant, Architect and Arboricultural and Ecological Consultants, with the aim of identifying a suitable building envelope while retaining existing significant trees and indigenous vegetation.

Site visits were undertaken in December 2006, February and April 2007.

The following documentation has been reviewed in preparation of this report:

(1) Site Plan prepared by Mike Foran Architecture dated 13 April 2007;
(2) Arborists Report 100 Wakehurst Parkway prepared by BioDesign & Associates dated April 2007.
(3) Bushfire Risk Assessment Proposed Development at 100 Wakehurst Parkway prepared by Fire Base Consulting dated March 2007;
(4) Requirements for Ecological Sustainability Plan Form 3a and 3b;
(5) Pittwater Council DCP 21;
(6) Management Plan for Threatened Fauna and Flora in Pittwater Smith and Smith 2000.
(7) Threatened species information from The National parks and Wildlife Atlas of NSW Wildlife April (Data license agreement CON04012);
(8) National Parks and Wildlife Services (2007) *Threatened Species Conservation Act-Final Determinations* [http://nationalparks.nsw.gov.au/npws.nsf/Content/Final+determinations April 2007;
(9) Benson and Howell (1994) The Natural Vegetation of the Sydney Region 1: 100 000 map sheet;
(10) Pittwater Council (2000) Significant Flora and Fauna species in the Pittwater Council area and Habitat Features for Vulnerable and Endangered Fauna from Conservation of Biodiversity DCP 25.

Flora Survey

Stage 1 flora assessment included a literature review to determine the likely occurrence of vulnerable, endangered or significant flora in the habitat supported by the site.

Stage 2 involved a ground truthed survey of the site. Species lists have been compiled for indigenous plant species identified on the site (Refer to Table 1 in Appendix). The vegetation above the rock escarpment and 30m contour was not surveyed due to access limitations.

In addition the site was surveyed for threatened or vulnerable species, populations or communities and for Pittwater Council's list of Regionally and Locally Significant Flora Species known to occur in the same or similar habitat (Refer Table 8 and 10 in Appendix for a list of endangered, vulnerable and significant flora species.)

Habitat Assessment

Stage 1 of the fauna assessment for the property included a literature review to determine the likely occurrence of vulnerable, endangered or significant fauna or their habitat at the site. (Refer Table 9 and 11 in Appendix for a list of endangered, vulnerable and significant flora species).

Stage 2 was to identify known habitat requirements of significant endangered and vulnerable species and populations known to occur within the Pittwater locality. This was completed during the Flora Survey.

Endangered and vulnerable species and populations recorded in the Pittwater Municipality are listed in the Appendix. To identify if suitable habitat features for endangered or vulnerable fauna occur at this property the habitat requirements of each of the listed species have been assessed and compared with the habitat supported by this property refer to Appendix for details. In addition recent recordings of each species have been included to determine likely geographic distribution of species. To determine the likely occurrence of species at this property, habitat requirements, known geographic distribution, mobility of fauna, location of roads, and proximity and extent of adjoining vegetation corridors, has been considered.

DCP 21 was consulted in preparation of this report specifically,
Section B4 Controls relating to the natural environment and C1 Landscaping.

An overview and map of existing vegetation has been completed for the property. Species lists have been compiled for existing trees, indigenous vegetation, exotic plants, noxious and environmental weeds identified on the site (Refer to Table 1, 2 and 3 in the Appendix).

3.0 Site Description
The site Lot 123 D.P. 113152 100 Wakehurst Parkway Elanora Heights. The property is south facing, slopes down to Wakehurst Parkway - opposite Narrabeen Lakes Foreshore Reserve and Lagoon. The property is bound by residential properties to the north, east and west. (Refer to Figure 1 and 2 Appendix).

The property includes an existing older style brick dwelling, driveway and garage, numerous large rock out crops, constructed low sandstone retaining walls and remnant indigenous vegetation.

The vegetation can be described in three distinct geographical areas.

1. The area below the 10m contour directly around the existing dwelling and associated structures. The vegetation in this area has been highly modified by previous development activity and includes environmental and noxious weeds some remnant indigenous trees and planted indigenous, native and exotic trees, shrubs and groundcovers.
2. The area above 10m contour includes numerous large rock outcrops and a greater percentage of indigenous species. The remnant indigenous vegetation includes species characteristic of Sandstone Woodland Vegetation with transition to mesophilic gully vegetation characterized by the presence of a number of rainforest species. Weed invasion is significant in the low and mid-strata between the 10 and 22m contour. Weed density decreases and indigenous groundcover and shrub diversity increases above the 22m contour in the area below the rock escarpment.
3. The area above the 30m contour and rock escarpment was not surveyed due to limited access. A remote visual assessment of the vegetation suggests existing vegetation is characteristic of Open

Sandstone Woodland with minimal weed invasion. This area is likely to provide the significant habitat for indigenous Fauna.

4.0 The Proposed Development

The proposed development includes subdivision of the existing lot into two lots, additions and alterations to the existing dwelling, new double garage on each lot a proposed new residence on the rear lot and removal of existing undesirable trees and vegetation with extensive replacement planting.

Refer to Figure 1 and 2 in the Appendix and Architectural Plans prepared by Mike Foran dated April 2007 for details.

The bushfire assessment report identified the area of the property from the southern boundary to the top of the escarpment (30m from the rear northern boundary) as an Inner Protection Area. Vegetation is to be maintained in accordance with the requirements of Section 4.2.2 "Planning for Bushfire Protection 2001".

Vegetation management requirements include maintaining all existing and proposed vegetation so that fuels are discontinuous (discontinuous shrub and tree canopy).

5.0 Vegetation & Habitat Assessment

The vegetation can be described in three distinct geographical areas Refer to Figures 1, 2 and 3.

The area below the 10m contour directly around the existing dwelling and associated structures. The vegetation in this area has been highly modified by previous development activity and includes:

- remnant indigenous trees including and Tree 41 an over mature specimen of *Eucalyptus botryoides* (Bangalay), Tree 30 a mature specimen of *Ceratopetalum gummiferum* (NSW Christmas Bush);
- Indigenous species likely to have been planted Trees 42 – 50 mature specimens of *Acmena smithii* and *Syzygium paniculatum* (Lilly Pilly). Trees 31-32 and 34- 38 semi-mature specimens of *Syzygium paniculatum* (Lilly Pilly), which have been planted in a row and repeatedly poorly pruned.
- Native and exotic trees, shrubs and groundcovers including Trees 24, 25 and 26 mature specimens of Cocos Palm exempt species under Pittwater Councils TPO. Tree 29 a mature specimen of NZ Christmas Bush, Tree 39 Schefflera actinophyla (Umbrella Tree) an exempt species under Pittwater Councils TPO, Tree 40 a mature specimen of *Harpephyllum caffrum* (Kaffir Plum) an exempt species under Pittwater Councils TPO. Shrubs including Camellia and Portwine Magnolia.
- Environmental and noxious weeds including Fishbone Fern, *Ehrharta erecta*, Bamboo and Tradescantia

The area above 10m contour includes numerous large rock outcrops, moderate weed invasion, planted native and exotic trees and a greater percentage of indigenous species. The remnant indigenous vegetation community can be described as an ecotone between Sandstone Woodland Vegetation with transition to mesophilic Sandstone Gully Vegetation characterized by the presence of a number of indigenous rainforest species.

- The remnant indigenous vegetation includes Tree 21 and 22 mature specimens of *Ficus rubginosa* (Port Jackson Fig), Tree 13 a mature specimen of *Synoum glandulosum* (Scentless Rosewood) in excellent health and condition, *Eucalyptus piperita* (Sydney Peppermint), *Eucalyptus botryoides* (Bangalay), *Livistona australis* (Cabbage Tree Palm) and *Elaocarpus reticulatus* (Blueberry Ash). Shrubs and ground covers include *Macrozamia communis* (Burrawang), *Calochlaena dubia* (Soft Bracken), *Hardenbergia violacea* (Native Sarsparella) and *Lomadra longifolia* (Mat-rush).
- A number of planted natives tree are located in this area including Trees 14 and 15 mature specimens of *Eucalyptus microcorys, and* Tree 6 an unidentified Eucalyptus *sp.*
- Weed invasion is significant in the low and mid-strata between the 10 and 22m contour. Weed density decreases and indigenous groundcover and shrub diversity increases above the 22m contour in the area below the rock escarpment. Weed species include noxious and environmental weeds including Asparagus Fern, Ochna, Fishbone Fern, Turkey Rhubarb, Tradescantia, *Ehrharta erecta* and *Senecio* sp.

The area above the 30m contour and rock escarpment was not surveyed due to limited access. A remote visual assessment of the vegetation suggests existing vegetation is characteristic of Open Sandstone Woodland with minimal weed invasion. This area is likely to provide the significant habitat for indigenous Fauna.

A number of specimens of *Syzygium paniculatum* were identified on the property. *Syzygium paniculatum* (Lilly Pilly) is listed as a Vulnerable species under the Threatened Species Conservation Act.

It is considered likely that specimens of this species have been planted. The species has been a popular landscape plant readily available from nurseries. Currently its popularity has declined for landscape use due to susceptibility to Psyllid attack on the foliage.

Weed Invasion

Weed invasion and density is most significant along the southern boundary and between the 9 and 22m contour.

A stand of Bamboo dominates the southern boundary.

Dominant weed species include Bamboo, Tradescantia, *Ehrharta erecta* Asparagus Fern, Fishbone Fern, (Panic Love Grass).

Seven species of noxious weeds were identified on the property (Refer Table 3 and 4 in Appendix).

Pittwater Councils Noxious Weed list and requirements for control under the Noxious Weed Act are listed in the appendix.

It is noted that changes to the noxious weed Act 1993, specifically changes to weed control classes and the requirements for weed control came into force on the 1st March 2006. Information in regards to the new noxious weed classes and required control has been obtained from Sydney Weeds and NSW Department of Primary Industries. Declared noxious weeds in the Pittwater Council area and legal requirements for control are included in the Appendix.

Habitat Assessment

The fauna assessment for this property is based on an assessment of available habitat at this site. Habitat requirements for fauna include known and potential food plants or foraging sites, shelter / roosting and nesting sites.

To identify if known and potential habitat features for endangered or vulnerable fauna occur at this property the habitat requirements of each of the listed species have been assessed and compared with the habitat supported by this property refer to Appendix for details (Pittwater Council 2000 and 2001, Smith & Smith 2000 & National Parks and Wildlife 2006). In addition recent recordings of each species have been included to determine likely geographic distribution of species. To determine the likely occurrence of species at this property, habitat requirements, known geographic distribution, mobility of fauna, and proximity and extent of adjoining vegetation corridors and core bushland, has been considered.

The area above the 30m contour and rock escarpment was not surveyed due to limited access. A remote visual assessment of the vegetation suggests existing vegetation is characteristic of Open Sandstone Woodland with minimal weed invasion. This area is likely to provide habitat for indigenous Fauna.

The close proximity of the site to bushland vegetation around Narrabeen Lagoon and Deep Creek, suggests this site has the potential to be used as secondary habitat for more mobile indigenous fauna. The area of the property

below the escarpment does not contain core or primary habitat such as significant food trees, nesting sites, roosting sites however it is possible fauna may utilize the habitat supported by the site periodically, for foraging for prey or vegetation and / or shelter while foraging for food.

Endangered and vulnerable species and populations recorded in the Pittwater Municipality and significant fauna species known or likely to occur within the close proximity to the site are listed in the Appendix in Table 8 and 10.

Habitat features for potential endangered and vulnerable fauna observed at this site include:

- Potential secondary foraging habitat for the Powerful Owl, Barking Owl and Spotted Quoll;
- Potential secondary foraging habitat for the Large-eared Pied Bat, Broad-nosed Bat, Common Bent Wing Bat and Grey-headed Flying Fox.

A hollow was observed in Tree 41 an over-mature specimen of *Eucalyptus botryoides* (Bangalay).This tree is located close to the electricity wires and all branches have been repeatedly lopped. As a component of the proposed landscape works this tree is proposed for removal with replacement planting.

Common urban bird species were observed or heard on or near the site during the flora survey. These species include, Rainbow Lorikeet, Australian Magpie, King Parrot, Blue Wren, Sulphur Crested Cockatoo and Native Minor.

The site is likely to provide foraging habitat for the Long-nosed Bandicoot. The Long-nosed Bandicoot is listed as a significant species in the Pittwater Municipality.

6.0 Impact of the Proposed Development

The most common impacts of development on existing trees and vegetation include vegetation removal, significant changes to soil levels, mechanical damage to existing root systems, mechanical damage to trunks and branches, soil compaction resulting in reduced soil water and air movement, changes in natural hydrology and soil contamination.

The impacts of development on indigenous fauna are directly related to the adverse impact on existing vegetation more specifically the impact on known and potential habitat (food, shelter, nesting and roosting sites) of indigenous fauna.

The proposed subdivision of one lot into two and subsequent proposed new dwelling and inclinator on lot two, requires the removal of a four native and indigenous trees;

- Trees 14 and 15 mature specimens of the planted native tree *Eucalyptus microcorys* (Tallowood).
- Tree 8 a mature specimen of indigenous *Eucalyptus piperita* (Sydney Pepermint)
- Tree 16 mature specimen of *Eucalyptus botryoides* (Bangalay);

The proposed building envelope requires the removal of an area of understory vegetation, which includes a variety of weed and indigenous species. The area has been disturbed by past development activity including construction of sandstone walls and construction of access tracks.

The proposed building envelope and inclinator have been located to retain Tree 13 a mature specimen of *Synoum glandulosum* (Scentless Rosewood), which was identified during the preliminary site meeting between the Applicant, Architect and Arboriculture and Ecological consultants as a significant tree.

The proposed alterations and additions to the existing dwelling involve minor changes to the existing building footprint. No significant impact on existing vegetation is expected.

Changes to the existing landscape on Lot 1 are also proposed. The proposal includes removal of existing undesirable, inappropriate or declining trees and vegetation and replacement with indigenous and native plantings.

Trees proposed for removal include

- Tree 41 an over mature specimen of *Eucalyptus botryoides* (Bangalay);
- Trees 31-32 and 34- 37 semi-mature specimens of *Syzygium paniculatum* (Lilly Pilly), which have been planted in a row and repeatedly poorly pruned.
- Trees 24, 25 and 26 mature specimens of Cocos Palm. Tree 29 a mature specimen of NZ Christmas Bush, Tree 39 a mature specimen of Schefflera actinophyla (Umbrella Tree) an exempt species under

Pittwater Councils TPO, Tree 40 a mature specimen of *Harpephyllum caffrum* (Kaffir Plum) an exempt species under Pittwater Councils TPO. Shrubs including Camellia and Portwine Magnolia.

Asset Protection Zone

The Bushfire Risk Assessment report has identified that the area of the property from the southern boundary to the top of the escarpment (30m from the rear northern boundary) be maintained as an Inner Protection Area. Vegetation is to be maintained in accordance with the requirements of Section 4.2.2 "Planning for Bushfire Protection 2001".

Vegetation management requirements include maintaining all existing and proposed vegetation so that fuels are discontinuous.

All proposed and existing vegetation must be maintained in accordance with vegetation management requirements for the nominated inner protection area, as detailed in the Bushfire Risk Assessment a, prepared by Fire Base Consulting dated March 2007.

The following recommendations have been identified to minimise the impact of the proposed development on the indigenous fauna with the aim of maintaining the ecological values of the site:

- Transplanting specimens of *Macrozamia communis* within the building envelope for the proposed new dwelling on proposed Lot 2.
- Sensitive and careful removal of Tree 41 *Eucalyptus botryoides* (Bangalay) specifically checking branch or trunk hollows for fauna before removal. Contacting animal rescue agency / or NPWS if fauna is located and requires relocation.
- Active habitat replacement – including extensive planting of indigenous tree, shrub and groundcover species;
- Commencement of a weed control and regeneration plan; and
- Preventing domestic animals from entering bushland at all times.

7.0 Ecological Sustainability Concept Plan

To be read in conjunction with Tables 1, 2, 3, 4, 5 & 6 and Figure 1, 2 and 3 Appendix.

Site Preparation & Vegetation Management

7.1 Site preparation prior to commencement of site works

Tree, vegetation and habitat protection

- Suitable tree and vegetation exclusion fencing is to be in place prior to commencement of site works. Exclusion fencing is required to ensure adequate protection of all trees and areas of vegetation to be retained (Refer to Appendix Figure 1 and Arborists report for details).

Sediment and erosion control for natural features

- Silt and sediment controls must be in place, down slope of all proposed excavation.

Weed control

- Commence weed control program for control of environmental and noxious weeds, specifically prevent flowing and fruiting and dispersal of weed species.

7.2 Site Management during construction works

General

- Excavated soil is to be removed from site. Excavated soil must not be spread throughout the site;
- There must be no soil level changes (cut or fill) other than those approved for the proposed development.
- Materials to be stored in designated storage areas. (Refer to Appendix Figure 1).
- There should be no storage of materials or disposal of excavated soil, or building waste within Tree Protection Zones or Vegetation Exclusion Zones.
- Relevant erosion and sediment control devices are to be in place for the duration of the building work.
- Vegetation Exclusion Fencing and Tree Protective fencing to be maintained for the duration of building work.

7.3 Vegetation Management

The aims of development controls for properties containing B 4.2 Flora and fauna habitat category 2 land, B4.4 Wildlife corridors, B4.5 Protection of native wildlife and C1 Landscaping include.

- The conservation, enhancement and/or creation of habitats for locally native flora and fauna and to ensure the long term viability of locally native flora and fauna and their habitats;
- The protection and enhancement of wildlife corridors;
- The protection of native wildlife from impacts of domestic animals;
- A built form dominated and complimented by landscape;
- A landscape that reflects the scale and form of the development.

The priorities for vegetation management include:

- The protection of locally indigenous canopy trees and vegetation to be retained;
- Replacement planting of indigenous canopy trees removed to accommodate the proposed development;
- Active habitat creation and replacement – including a minimum of 80% locally indigenous trees, shrubs and groundcovers in the proposed landscape;
- Screening 60% of the proposed dwelling from the front boundary;
- Nominating existing indigenous trees to be retained and the remnant indigenous vegetation located between the rear of the proposed new dwelling and northern boundary as bushland to be retained for the life of the development; and
- Implementing a bush regeneration / weed control plan to control environmental and noxious weeds, and support natural regeneration of the remnant indigenous vegetation to be retained.

The appendix includes an Indicative Planting Schedule for Landscape Areas (Table 6) and Indigenous plant schedule identifying suitable indigenous groundcover, shrub and tree species for revegetation (Table 5).

7.3.1 Revegetation/restoration and rehabilitation recommendations

- All vegetation (existing and proposed) must comply with Bushfire Protection Asset Protection Zone requirements for an Inner Protection Zone (IPZ). Vegetation management requirements include maintaining scattered or clumped shrubs separated so there is no continuous shrub layer, with canopy trees separated so there is no continuous tree canopy layer.
- Plant material for Landscape and restoration / revegetation areas is to incorporate 80% locally indigenous species. Indicative Planting Schedule for Landscape Areas (Table 6) and Indigenous plant schedule identifying suitable indigenous groundcover, shrub and tree species for revegetation is located in the Appendix.
- Implementation of a weed control and bush regeneration program for the property.

Vegetation to be retained for the life of the development

All indigenous canopy trees to be retained and the area of vegetation between the rear of the existing dwelling and northernt boundary have been nominated as significant vegetation to be retained for the life of the development.

Landscape Planting
Landscaping/ revegetation

Refer to Figure 1 and Table 6 and 7 in Appendix
Landscape planting / revegetation is proposed in areas where the likelihood of natural regeneration is considered limited and / or where plant material is to be used to address functional requirements such as screening or soil/ slope stabilisation.

The Landscape / Ecological Sustainability Concept Plan has been prepared to incorporate existing natural features (natural vegetation, bush rock and regeneration areas).

The indicative plant / revegetation schedule and Landscape / Ecologically Sustainability Concept plan has been developed to addresses the aims of development controls B4.2, 4.4, 4.5 and C1.1 specifically issues of screening, habitat creation, support of regeneration areas, replacement canopy tree planting while maintaining adequate solar access to the proposed dwellings and outdoor areas and complying with recommendations for Bushfire Protection Measures.

Landscape areas are to be mulched to a depth of 75mm and additional soil (if required) is to be a low phosphorous native mix.

Extensive revegetation is not considered appropriate in nominated regeneration areas.

Mulch is not recommended in nominated regeneration areas.

Regular and ongoing maintenance of revegetation and landscape plantings will be require following completion of site works (watering, weed control, replacement of plant losses, pest and disease control).

7.3.2 Weed Control and Regeneration Concept Plan

A weed control, revegetation and revegetation plan, targeting noxious and environmental weeds has been developed for the site.

Regeneration, revegetation and weed control concept plan:

- Commence control of the noxious weed species *Asparagus aethiopicus* (Asparagus Fern), *Lantana camara* (Lantana), *Ochna serrulata* (Mickey Mouse Plant), *Anredera* sp. (Madeira Vine), *Ligustrum* sp. (Small-leaved Privet) and Bamboo as per requirements;
- Commence control of environmental weeds and invasive exotic garden plants (e.g. Ehrharta, Fishbone Fern, Tradescantia);
- Use of appropriate weed control techniques to prevent soil erosion and to maximize effective and efficient weed control (Refer Appendix);
- Ongoing weed control will be required for the life of the development to prevent noxious and environmental weed species from flowing / seeding and spreading throughout the property and adjoining properties.

8.0 Recommendations

Recommendations have been included to minimize the impact of the proposed development on the existing indigenous trees and vegetation, habitat for indigenous fauna and to address the aims of identified development controls and outcomes with the aim of maintaining the ecological values of the site.

Controls relating to the natural environment, which apply to the property at 100 Wakehurst Parkway, include B 4.2 Flora and fauna habitat category 2 land, B4.4 Wildlife corridors, B4.5 Protection of native wildlife and C1.1 Landscaping.

The habitat and ecological values of the site can be enhanced and maintained by:

- Nominating existing indigenous trees to be retained and the remnant indigenous vegetation located between the rear of the proposed new dwelling and northern boundary as bushland to be retained for the life of the development; and
- Implementing a bush regeneration / weed control plan to control environmental and noxious weeds, and support natural regeneration of the remnant indigenous vegetation to be retained.
- Active habitat replacement – including extensive supplementary and replacement planting of indigenous tree, shrub and groundcover species;

Recommendations:

- The project arborist/ bushland management consultant is to supervise the installation of tree and vegetation protective fencing. Tree and vegetation protective fencing must be adequate to protect all existing trees and vegetation to be retained from the adverse impact of construction activity. Tree protective fencing is to be in place prior to commencement of site works and is to be maintained for the duration of construction works;
- Adequate erosion and sediment control devices are to be installed prior to the commencement of site works and are to be maintained for the duration of the construction works;
- Specimens of *Macrozamia communis* within the building envelope for the proposed new dwelling on proposed Lot 2 are to be transplanted to a suitable location on the site prior to the commencement of building works;
- Prior to the removal of Tree 41 *Eucalyptus botryoides* (Bangalay) any branch and trunk hollows must be checked for fauna before tree removal. Animal rescue agency / or NPWS are to be contacted if fauna is observed and requires relocation.
- Materials and stock piled subsoil and topsoil are be stored in designated storage area only;
- There is to be no storage of materials or disposal of excavated soil, or building waste within, Tree and Vegetation Exclusion Zones;

- There **must be no** increase or decrease in soil level or excavation within 5m of all existing trees and vegetation to be retained, unless soil level changes or excavation form part of the approved development consent;
- Surplus excavated soil not required for any approved cut and fill is to be removed from site. Excavated soil is **not** to be spread throughout the vegetation to be retained.
- Landscaping works in Landscape Areas (A – M) are to incorporate active habitat replacement – including extensive planting of indigenous tree, shrub and groundcover species (80% locally indigenous species);
- Any final Detailed Planting / Landscape Plan is to incorporate plant species derived from the indicative plant / revegetation schedules detailed in Table 5 and 6. To comply with development controls the final Detailed Landscape Plan is to incorporate a minimum of 80% locally native plant species.
- Landscape Area N is to be nominated as a regeneration area, extensive planting is not recommended.
- Indigenous trees to be retained and the remnant indigenous vegetation located between the rear of the proposed new dwelling and northern boundary is to be nominated bushland to be retained for the life of the development. (To be maintained in accordance with Pittwater Councils Tree Preservation and Management Order;
- A staged program of weed control targeting identified noxious and environmental weeds is to be implemented over the entire property;
- Domestic animals must be prevented from entering bushland at all times.
- A minimum of 80% locally indigenous species are to be used in all other proposed landscape areas.
- All proposed and existing vegetation within the nominated IPA - from the southern boundary to the top of the escarpment (30m from the rear northern boundary) is to be maintained in accordance with the requirements of Section 4.2.2 "Planning for Bushfire Protection 2001". Vegetation management requirements include maintaining all existing and proposed vegetation so that fuels are discontinuous (discontinuous shrub and tree canopy).

9.0 Conclusions

The proposed development includes subdivision of the existing lot into two lots, additions and alterations to the existing dwelling, new double garage on each lot a proposed new residence on the rear lot and removal of existing undesirable trees and vegetation with extensive replacement planting.

The property includes an existing older style brick dwelling, driveway and garage, numerous large rock out crops, constructed low sandstone retaining walls and remnant indigenous vegetation.

The vegetation can be described in three distinct geographical areas.
The area below the 10m contour directly around the existing dwelling and associated structures. The vegetation in this area has been highly modified by previous development activity and includes environmental and noxious weeds some remnant indigenous trees and planted indigenous, native and exotic trees, shrubs and groundcovers.

The area above 10m contour includes numerous large rock outcrops and a greater percentage of indigenous species. The remnant indigenous vegetation includes species characteristic of Sandstone Woodland Vegetation with transition to mesophilic gully vegetation characterized by the presence of a number of rainforest species.

The area above the 30m contour and rock escarpment was not surveyed due to limited access. A remote visual assessment of the vegetation suggests existing vegetation is characteristic of Open Sandstone Woodland with minimal weed invasion.

The proposed subdivision of one lot into two and subsequent proposed new dwelling and inclinator on lot two, requires the removal of a four native and indigenous trees;

- Trees 14 and 15 mature specimens of the planted native tree *Eucalyptus microcorys* (Tallowood).
- Tree 8 a mature specimen of indigenous *Eucalyptus piperita* (Sydney Pepermint)
- Tree 16 mature specimen of *Eucalyptus botryoides* (Bangalay);

The proposed building envelope requires the removal of an area of understory vegetation, which includes a variety of weed and indigenous species. The area has been disturbed by past development activity including construction of sandstone walls and construction of access tracks.

The proposed building envelope and inclinator have been located to retain Tree 13 a mature specimen of *Synoum glandulosum* (Scentless Rosewood), which has been identified as a significant tree.

The proposed alterations and additions to the existing dwelling involve minor changes to the existing building footprint. No significant impact on existing vegetation is expected.

Changes to the existing landscape on Lot 1 are also proposed. The proposal includes removal of existing undesirable, inappropriate or declining trees and vegetation and replacement with indigenous and native plantings.

Trees proposed for removal include

- Tree 41 an over mature specimen of *Eucalyptus botryoides* (Bangalay);
- Trees 31-32 and 34- 37 semi-mature specimens of *Syzygium paniculatum* (Lilly Pilly), which have been planted in a row and repeatedly poorly pruned.
- Trees 24, 25 and 26 mature specimens of Cocos Palm. Tree 29 a mature specimen of NZ Christmas Bush, Tree 39 a mature specimen of Schefflera actinophyla (Umbrella Tree) an exempt species under Pittwater Councils TPO, Tree 40 a mature specimen of *Harpephyllum caffrum* (Kaffir Plum) an exempt species under Pittwater Councils TPO. Shrubs including Camellia and Portwine Magnolia.

A number of specimens of *Syzygium paniculatum* were identified on the property and are proposed for removal. *Syzygium paniculatum* (Lilly Pilly) is listed as a Vulnerable species under the Threatened Species Conservation Act. It is considered likely that Trees 31-32 and 34- 37 semi-mature specimens of *Syzygium paniculatum* (Lilly Pilly), have been planted.

The bushfire assessment report identified the area of the property from the southern boundary to the top of the escarpment (30m from the rear northern boundary) as an Inner Protection Area. Vegetation is to be maintained in accordance with the requirements of Section 4.2.2 "Planning for Bushfire Protection 2001".

Vegetation management requirements include maintaining all existing and proposed vegetation so that fuels are discontinuous (discontinuous shrub and tree canopy).

The close proximity of the site to bushland vegetation around Narrabeen Lagoon and Deep Creek, suggests this site has the potential to be used as secondary habitat for more mobile indigenous fauna. The area of the property below the escarpment does not contain core or primary habitat such as significant food trees, nesting sites, roosting sites however it is possible fauna may utilize the habitat supported by the site periodically, for foraging for prey or vegetation and / or shelter while foraging for food.

It is considered unlikely that the proposed development will have a significant adverse impact on indigenous flora and fauna provided that the tree and

vegetation protection and management recommendations detailed in this report are adopted and implemented.

I am a qualified Bushland Management Consultant/ Ecologist.
I hold the following qualifications
B.Sc. (Environmental and Urban Horticulture) MAABR, MAIH, MAISA

I certify that this report complies with DCP No. 21 Pittwater 21

Julia Stanton Ecologist / Bushland Management Consultant 9th May 2007

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Table 1 Existing tree schedule

Tree No.	Botanical Name	Common Name	Age Class	Proposal
1	*Elaeocarpus reticulatus*	Blueberry Ash	Mature	Retain
2	*Eucalyptus* sp.	Eucalypt	Juvenile	Retain
3	*Livistona australis*	Cabbage Tree Palm	Semi-mature	Retain
4	*Eucalyptus piperita*	Sydney Peppermint	Over-mature	Retain
5	*Eucalyptus piperita*	Sydney Peppermint	Juvenile	Retain
6	*Eucalyptus* sp.	Eucalypt	Mature	Retain
7	*Eucalyptus piperita*	Sydney Peppermint	Juvenile	Remove
8	*Eucalyptus piperita*	Sydney Peppermint	Mature	Remove
9	*Elaeocarpus reticulatus*	Blueberry Ash	Juvenile	Retain
10	*Synoum glandulosum*	Scentless Rosewood	Mature	Retain
11	*Eucalyptus microcorys*	Tallowood	Mature	Retain
12	*Elaeocarpus reticulatus*	Blueberry Ash	Mature	Retain
13	*Synoum glandulosum*	Scentless Rosewood	Mature	Retain/ significant
14	*Eucalyptus microcorys*	Tallowood	Mature	Remove
15	*Eucalyptus microcorys*	Tallowood	Mature	Remove
16	*Eucalyptus botryoides*	Bangalay	Mature	Remove
17 -20	*Syagrus romanzoffianum*	Cocos Palm	Mature	Remove
21	*Ficus rubiginosa*	Port Jackson Fig	Mature	Retain
22	*Ficus rubiginosa*	Port Jackson Fig	Mature	Retain
22a	*Eucalyptus* sp.	Eucalypt	Semi-mature	Retain
22b	*Eucalyptus* sp.	Eucalypt	Semi-mature	Retain
22c	*Livistona australis*	Cabbage Tree Palm	Semi-mature	Retain
23	*8 x Acmena smithii*	Lily Pily	Semi-mature	Retain
24-26	*Syagrus romanzoffianum*	Cocos Palm	Mature	Remove
27	*Jacaranda mimosifolia*	Jacaranda	Mature	Remove
28	*Archontophoenix alaxandrae*	Alexandra Palm	Mature	Retain
29	*Meterosiderous* sp.	NZ Christmas Bush	Semi-mature	Remove

Tree No.	Botanical Name	Common Name	Age Class	Proposal
30	*Ceratopetalum gummiferum*	NSW Christmas Bush	Mature	Retain
31 -32	*Syzygium paniculatum*	Lilly Pilly	Semi-mature	Remove
33	*Schefflera actinophylla*	Umbrella Tree	Mature	Remove
34-37	*Syzygium paniculatum*	Lilly Pilly	Semi-mature	Remove
38	*Syzygium paniculatum*	Lilly Pilly	Semi-mature	Retain
39	*Schefflera actinophylla*	Umbrella Tree	Mature	Remove
40	*Harpephyllum caffrum*	Kaffir Plum	Mature	Remove
41	*Eucalyptus botryoides*	*Bangalay*	Over-mature	Remove
42	*Acmena smithii*	Lilly Pilly	Mature	Retain
43	*Koelreuteria paniculatum*	Golden Rain Tree	Mature	Retain Neighbouring property.
44 - 49	*Acmena smithii*	Lilly Pilly	Mature	Retain
50	*Syzygium paniculatum*	Lilly Pilly	Mature	Retain

Table 2. Indigenous Flora Survey 100 Wakehurst Parkway Elanora Heights

Botanical Name	Common Name
Trees	
Acmena smithii	Lilly Pilly
Eucalyptus piperita	Sydney Peppermint
Eucalyptus botryoides	Bangalay Gum
Ficus rubiginosa	Port Jackson Fig
Glochidion ferdinandi	Cheese Tree
Livistona australis	Cabbage Tree Palm
Pittosporum undulatum	Sweet Pittosporum
Syzygium paniculatum	Lilly Pilly
Small Trees / large shrubs	
Bankisa integrifolia	Coastal Banksia
Ceratopetalum gummiferum	NSW Christmas Bush
Elaeocarpus reticulatus	Blueberry Ash
Synoum glandulosum	Scentless Rosewood
Shrubs	
Breynia oblongifolia	Breynia
Pittosporum revolutum	Rough-fruit Pittosporum
Grasses / Strappy	
Dianella caerulea	Blue Flax Lilly
Entolasia stricta	Right-angled Grass
Lomandra longifolia	Mat Rush
Macrozamia communis	Burrawang
Oplismínus sp.	Basket Grass
Poa affinis	Poa
Xanthorrrhoea sp	Grass Tree

Botanical Name	Common Name
Ferns / Orchids	
Blechnum cartilagineum	Gristle Fern
Calochlaena dubia	Soft Bracken
Pteridium esculentum	Bracken
Herbs	
Pratia purpurascens	White Root
Pseuderanthemum variable	Pastel Flower
Shelhammera undulata	Lilac Lily
Climbers / Scramblers	
Cissus hypoglauca	Gum Vine
Eustrephus latifolius	Wombat-berry
Geitonoplesium cymosum	Scrambling Lilly
Glycine microphylla	Glycine
Hardenbergia violacea	False Sarsaparilla
Hibbertia dentata	Hibbertia
Pandorea pandorana	Wonga Wonga Vine
Smilax sp	

Table 3. Exotic and native plantings and noxious and environmental weeds 100 Wakehurst Parkway Elanora Heights

Botanical Name	*Common Name*	*Category*
Noxious Weeds		
Acetosa sagittata	Turkey rhubarb	4
Anredera cordifolia	Madiera Vine	4
Asparagus aethiopicus	Asparagus Fern	4
Lantana camara	Lantana	4 and 5
Ligustrum sinense	Small-leaved Privet	4
Ochna serrulata	Mickey Mouse Plant	4
Phyllostachys spp.	Bamboo	4
Environmental Weeds		
Bidens pilosa	Cobblers Pegs	Environmental Weed
Conyza sp	Fleabane	Environmental Weed
Crassocephalum crepidiodes	Thickhead	Environmental Weed
Ehrharta erecta	Panic Love Grass	Environmental Weed
Nephrolepis cordifolia	Fishbone Fern	Environmental Weed
Senna pendula var. glabrata	Cassia	Environmental Weed
Senecio sp.	Daisy	Environmental Weed
Setaria palmifolia	Palm Grass	Environmental Weed
Tradescantia sp..	Wandering Jew	Environmental Weed
Native and Exotic Garden		
Archontophoenix alexandrae	Alexandra Palm	Native Palm
Clivea sp.	Kaffir Lilly	Exotic Garden
Camellia sp.	Camellia	Exotic Garden
Michelia figo	Port Wine Magnolia	Exotic Garden
Eucalyptus microcorys	Tallowood	Native Tree Planted
Metrosideros sp.	NZ Christmas Bush	Exotic Garden
Philodendron sp.	Philodendron	Exotic Garden
Syagrus romanzoffianum	Cocos Palm	Exotic Garden
Wisteria sp.	Wisteria	Exotic Garden
		ENV Weed

Order 19 of the Noxious Weeds Act 1993 declares certain plants to be noxious weeds in one (or more) of five weed classes:

Class 1 - State Prohibited Weeds. *"The plant must be eradicated from the land and the land must be kept free of the plant."*
Class 2 - Regionally Prohibited Weeds. "*The plant must be eradicated from the land and the land must be kept free of the plant."*
Class 3 - Regionally Controlled Weeds. *"The plant must be fully and continuously suppressed and destroyed."*
Class 4 - Locally Controlled Weeds. *"The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority."*
Class 5 - Restricted Plants. *"The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with."*

The control objectives for each class are:
Class 1 is to prevent the introduction and establishment of those plants in NSW.
Class 2 is to prevent the introduction and establishment of those plants in parts of NSW.
Class 3 is to reduce the area and the impact of those plants in parts of NSW.
Class 4 is to minimise the negative impact of those plants on the economy, community or environment of NSW.
Class 5 is to prevent the introduction of those plants into NSW, the spread of those plants within NSW or from NSW to another jurisdiction.

It is noted that changes to the noxious weed Act 1993, specifically changes to weed control classes and the requirements for weed control came into force on the 1st March 2006. Information in regards to the required control according to the measures specified in a management plan published by the local control authority (Pittwater Council) have been obtained in generic form from the Sydney Weeds Web Site. For the purpose of this report weed control requirements are based on the generic Weed Control Management Plans.

Table 4. Declared noxious weeds identified 100 Wakehurst Parkway.

Noxious Weed	Common Name	Required Action
Asparagus aethiopicus	Asparagus Fern	Class 4: "The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed". The local control authorities specify the following measures to control this weed: *All fruits and seeds must be removed. This plant must be prevented from spreading across the property boundary.* *If removal of fruits and seeds is not possible or the plant is not continuously prevented from spreading across a property boundary, the entire plant must be removed/ destroyed.*
Lantana camara	Lantana	Class 4: "The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority". The above local control authorities specify the following measures to control this weed: *Individual specimens and small infestations must be completely removed.* *For larger infestations, prevent the spread and gradually reduce the extent of Lantana, with due consideration to impact on native fauna habitat, by treating plants using any of the recommended techniques depending on the size of infestation and accessibility. A weed management plan for the site must be completed by the landholder and approved by the Local Control Authority. This will take into account any impacts on erosion, native or desirable surrounding vegetation and fauna that will be affected by the control of the lantana.*
Ochna, Ligustrum sinense	Mickey Mouse Small-leaved Privet	Class 4: "The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed". The above local control authorities specify the following measures to control this weed: *For small infestations on privately owned land, unless maintained as a formal hedge where all flowering and fruiting is prevented, all plants must be removed/destroyed. For large infestations, the spatial extent must be reduced by a minimum of 25% annually.* *On public land, Ochna must be strategically controlled and reduced according to available resources.*
Phyllostachys sp.	Rhizomatous Bamboo	Class 4: "The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed". The above local control authorities specify the following measures to control this weed: *Any part of this weed must be prevented from growing within 3m of the boundary of a property or contained by an effective root barrier.* *An effective root barrier must be properly installed to effectively contain the plant and enable regular inspections and maintenance. If the plant cannot be prevented from growing within 3m of a property boundary it must be destroyed.*
Acetosa sagittata	Turkey Rhubarb	Class 4: "The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed". No further control has been detailed
Anredera cordifolia	Madeira Vine	Class 4: "The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed". The local control authorities specify the following measures to control this weed: *The plant may not be sold propagated or knowingly distributed.* *This plant must be prevented from growing within 1m of the property boundary. All tubers of this plant must be removed.*

Techniques for weed control.

Weed species should be prevent from seeding at all times.
Remove seed or flower heads to prevent spread and dispersal of weed seeds as required.

Woody weeds - (Bamboo, Lantana, Cassia, Paddies Lucerne,) cut and poison (use concentrated Glyphosate 360). Leaving the root system insitu to minimise soil erosion. (Repeat applications may be required for control of Bamboo)
Ochna - scrape or drill lower trunk and poison with concentrated Gylphosate.
Asparagus Fern- controlled by removal of woody crowns (small water tubers can be left in situ to minimise soil erosion). Seeds should be removed and placed in a bag.
Fishbone Fern – Hand removal or repeated spot spray with Glyphosate 360 at a concentration of 1:100.
Tradescantia – Hand removal or repeated spot spray with Glyphosate 360 at a concentration of 1:100.
Vines (Maderia Vine, Turkey Rhubarb, Wisteria) – Controlled by hand removal and scraping and poisoning lower stems with Glyphosate 360g/l
Grasses and other annual weeds (Fleabane, Paspalum, Bidens, Couch, Buffalo, Panic Love Grass, Sow Thistle) - controlled by spraying Glyphosate 360 at a concentration of 1:100. Leaving the root system insitu to minimise soil erosion (seed heads must be removed at all times to prevent seed dispersal).

Table 5. Noxious Weeds in Pittwater

The following weeds are declared noxious in the Pittwater control area.

Common name	Scientific name	Class
African Feathergrass	*Pennisetum macrourum*	5
African Turnipweed	*Sisymbrium runcinatum*	5
African Turnipweed	*Sisymbrium thellungii*	5
Alligator weed	*Alternanthera philoxeroides*	3
Anchored water hyacinth	*Eiichornia azurea*	1
Annual ragweed	*Ambrosia artemisifolia*	5
Arrowhead	*Sagittaria montevidensis*	5
Artichoke thistle	*Cynara cardunculus*	5
Asparagus fern	*Asparagus aethiopicus*	4
Athel tree	*Tamarix aphylla*	5
Bitou bush	*Chrysanthemoides monilifera ssp rotunda*	3
Black knapweed	*Centaurea nigra*	1
Blackberry	*Rubus fruticosus (agg. spp.)*	4
Boneseed	*Chrysanthemoides monilifera ssp monilifera*	3
Bridal Creeper	*Asparagus asparagoides*	5
Broomrape	*Orobanche spp.*	1
Burr ragweed	*Ambrosia conferiflora*	5
Cabomba	*Cabomba spp.*	5
Castor oil plant	*Ricinus communis*	4
Cayenne snakeweed	*Stachytarpheta cayennensis*	5
Chillean needle grass	*Nassella neesiana*	4
Chinese violet	*Asystasia gangetica*	1
Climbing asparagus	*Asparagus plumosus*	4
Clockweed	*Gaura lindeimeri*	5
Clockweed	*Gaura parviflora*	5
Corn sowthistle	*Sonchus arvensis*	5
Dodder	*Cuscuts sp.* Except native species	5
East Indian hygrophila	*Hygrophila polysperma*	1
Espartillo	*Achatherum brachychaetum*	5
Eurasian water milfoil	*Myriophyllum spicatum*	1
Fine-bristled burr grass	*Cenchrus brownii*	5
Fountain Grass	*Pennisetum setaceum*	5
Gallon's curse	*Cenchrus biflorus*	5
Giant Reed	*Arundo donax*	4
Glaucous starthistle	*Carthamus glaucus*	5
Golden thistle	*Scolymus hispanicus*	5
Green cestrum	*Cestrum parqui*	4
Harrisia cactus	*Harrisia spp.*	4
Hawkweed	*Hieracium spp.*	1
Horsetail	*Equisetum spp.*	1
Hygrophila	*Hygrophila costata*	2
Hymenachne	*Hymenachne amplexicaulis*	1
Karroo thorn	*Acacia karroo*	1
Kochia	*Kochia scoparia*	1
Lagarosiphon	*Lagarosiphon major*	1
Lantana	*Lantana sp.*	4 and 5

Common name	Scientific name	Class
Long-leaf willow primrose	*Ludwigia longifolia*	4 and 5
Ludwigia	*Ludwigia peruviana*	3
Madeira vine	*Anredera cordifolia*	4
Mexican feather grass	*Nassella tenuissima syn Stipa tenuissima*	1
Mexican poppy	*Argemone mexicana*	5
Miconia	*Miconia spp.*	1
Mimosa	*Mimosa pigra*	1
Morning glory	*Ipomea indica*	4
Morning glory	*Ipomea cairica*	4
Mossman River grass	*Cenchrus echinatus*	5
Moth vine	*Araujia sericifera*	4
Ochna	*Ochna serrulata*	4
Onion Grass	*Romulea sp.*	5
Oxalis	*Oxalis sp.* Except native sp.	5
Pampas grass	*Cortaderia spp.*	4
Parthenium weed	*Parthenium hysterophorus*	1
Pellitory	*Parietaria judaica*	4
Pond Apple	*Annona glabra*	1
Prickly pears	*Opuntia spp.*	4
Prickly pear	*Cylindropuntia*	4
Prickly acacia	*Acacia nilotica*	1
Privet - broadleaf	*Ligustrum lucidum*	4
Privet - narrowleaf	*Ligustrum sinense*	4
Red Rice	*Oryza rufipogon*	5
Rhizomatous bamboo	*Phyllostachys spp.*	4
Rhus tree	*Toxicodendron succedaneum*	4
Rubbervine	*Cryptostegia grandiflora*	1
Sagittaria	*Sagittaria platyphylla*	5
Salvinia	*Salvinia molesta*	2
Sand oat	*Avena strigosa*	4
Scotch broom	*Cytisus scoparius*	4
Senegal tea plant	*Gymnocoronis spilanthoides*	1
Serrated tussock	*Nassella trichotoma*	4
Siam weed	*Chromolaena odorata*	1
Smooth-stemmed turnip	*Brassica barrelieri ssp oxyrrhina*	5
Soldier thistle	*Picomon acarna*	5
Spotted knapweed	*Centaurea maculosa*	1
St John's wort	*Hypericum perforatum*	4
Texas blueweed	*Helianthus ciliaris*	5
Turkey rhubarb	*Acetosa sagittata*	4
Water caltrop	*Trapa sp.*	1
Water hyacinth	*Eichhornia crassipes*	2
Water lettuce	*Pistia stratiotes*	1
Water soldier	*Stratiotes aloides*	1
Willows	*Salix spp.*	5
Witchweed	*Striga* sp.except native species	1
Yellow burrhead	*Limnocharis flava*	1
Yellow nutgrass	*Cyperus esculentus*	5

Table 6. Indigenous plant species suitable for revegetation in remnant bushland and nominated restoration areas at 100 Wakehurst Parkway.
(List developed from species identified on the property or nearby remnant bushland of a similar vegetation community)

Botanical Name	Common Name
Ground Covers	
Blechnum cartilagineum	Blechnum
Clematis aristata Climber/ Scrambler	Old Mans Beard
Dianella caerulea	Blue Flax Lilly
Dichondra repens	Kidney Weed
Hardenbergia violocaea	Happy Wanderer
Hibbertia dentana	Guinea Flower
Hibbertia scandens Climber/ Scrambler	Snake Vine
Lomandra longifolia	Mat-rush
Pandorea pandorana Climber/ Scrambler	Wonga wonga vine
Poa affinis	Poa
Pratia purpurescens	Pratia
Themeda australis	Kangarro Grass
Shrubs	
Acacia myrtifolia	Myrtle Wattle
Acacia suaveolens	Sweet-scented wattle
Banksia spinulosa	Hair-pin Banksia
Goodenia ovata	Yellow Flowered Hop-bush
Grevillea sericea	Pink Spider Flower
Pittosporum revolutum	Large-fruited Pittosporum
Ozothamnus diosmifolia	Rice Flower
Polyscias sambucifolia	Elderberry Panax
Large Shrubs / Small Trees	
Allocasuarina littoralis	Black She-oak
Acacia floribunda	Sally Wattle
Acmena smithii	Lilly Pilly
Banksia integrifolia	Coast Banksia
Ceratapetalum gummiferum	NSW Christmas Bush
Elaeocarpus reticulatus	Blueberry Ash
Livistona australis	Cabbage Tree
Canopy Trees	
Allocasuarina torulosa	Forest She-oak
Angophora costata	Sydney Red Gum
Casuarina glauca	Swamp Oak
Glochidion ferdinandi	Cheese Tree
Eucalyptus botryoides	Bangalay
Eucalyptus piperita	Sydney Peppermint

Nurseries, which supply indigenous plants

Ku ring gai Community Nursery 430 Mona Vale Rd St Ives 94240825	Harvest Seeds and Native Plants Terry Hills 94502699	Toolijooa Nursery Ingleside 99708709	Tharwa Nusery 21 Myoora Rd Terry Hills 94501967

Table 7. Vegetation management and Indicative Planting Schedule for proposed Landscape Areas

Landscape Planting is proposed in areas where natural regeneration is considered limited and / or where plant material is to be used to address functional requirements such as screening or soil / slope stabilisation.

The indicative plant schedule and landscape concept plan has been developed to addresses the aims of development controls B4.2, 4.4, 4.5 and C1 specifically issues of screening, habitat creation, replacement canopy tree planting while maintaining adequate solar access to the proposed dwellings and outdoor areas and complying with recommendations for Bushfire Protection Measures.

The proposed indicative plant schedule incorporates a majority of locally indigenous species. A select number of native and exotic species have been included. Native and exotic species have only been included where it is considered that species are unlikely to present as environmental weeds.

The indicative plant schedule includes a variety of suitable plant species for identified landscape areas from which the final detailed planting plan is to be derived. To comply with development controls the final Detailed Landscape Plan is to incorporate a minimum of 80% locally native plant species.

Landscape Area A
Southern boundary 4m screening to replace existing Bamboo Species can be pruned and maintained at 4m in height.

Botanical Name	Common Name	Mature Height
Banksia integrifolia (I)	Coastal Banksia	3-6m
Ceratopetalum gummiferum (I)	NSW Christmas Bush	3-4m
Elaeocarpus reticulatus (I)	Blueberry Ash	2-6m
Syzygium paniculatum "Dwarf" Select Form (N)	Dwarf Lilly Pilly	2-4m

Landscape Area B
Mixed shrubs and groundcovers – 1.5m, strap leafed foliage accent planting with sandstone feature rocks

Botanical Name	Common Name	Mature Height
Acacia "Limelight" (N)	Dwarf Wattle	1m
Baeckea virgata Dwarf (N)	Dwarf Baeckea	1m
Banksia spinulosa (I)	Hair-pin Banksia	1.5 – 2m
Correa alba (I)	Correa	1.5m
Dianella caerulea (I)	Flax Lilly	0.5m (Strapy)
Doryanthes excelsa (N)	Gymea Lilly	1.5 – 2m (Strapy)
Eriostemon myoporoides (N)	Wax Flower	1.5m
Grevillea sericea (I)	Pink Spider Grevillea	1.5m
Hardenbergia violacea (I)	Native Sarsaparilla	Groundcover
Hibbertia scandens (I)	Yellow Guinea Vine	Groundcover
Lomandra longifolia (I)	Mat-rush	1m (Strapy)
Macrozamia communis (I)	Native Cycad	1m (Strapy)

Landscape Area C
Screen planting 2- 3m species can be pruned and maintained at desired height

Botanical Name	Common Name	Mature Height
Banksia ericifolia	Health Banksia	2 - 3m
Ceratopetalum gummiferum (I)	NSW Christmas Bush	3-4m
Elaeocarpus reticulatus (I)	Blueberry Ash	2-6m
Syzygium paniculatum "Dwarf" Select Form (N)	Dwarf Lilly Pilly	2-4m

Landscape Area D
Rainforest / Tropical landscape to compliment existing Alexandra Palms
Driveway edge screening to 1.5m

Botanical Name	Common Name	Mature Height
Asplenium australacium (N)	Birds Nest Fern	1m
Elataria cardomomum (E)	Cardamon	1.5-2m
Cordyline sp. (E)	Cordyline	1.5m
Licuala ramsayi (N)	Native Fan Palm	2m
Macrozamia communis (I)	Native Cycad	1m
Doodia aspera (I)	Rasp Fern	Groundcover
Philodendrn "Xanadu"	Philodendron	0.5m
Eriostemon myopiroides	Wax Flower	1.5m
Correa alba (I)	Correa	1.5m

Landscape Area E
Feature large shrubs / small trees 2-3m in height

Botanical Name	Common Name	Mature Height
Grevillea "Grace" (N)	Grevillea	3m
Buckinghamia celssissima (N)	Ivory Curl	3-4m
Westringia longifolia (N)	Westringia	2m
Ceratopetalum gummiferum (I)	NSW Christmas Bush	3-4m
Elaeocarpus reticulatus (I)	Blueberry Ash	2-6m
Corydline australis "Purpurea"	NZ Purple Cordyline	2-3m
Lomandra seascape (N)	Fine Grey Lomandra	1m

Landscape Area F
Boundary screening adjacent to driveway

Botanical Name	Common Name	Mature Height
Acmena smithii	Lilly Pilly	3-6m
Ceratopetalum gummiferum (I)	NSW Christmas Bush	3-4m
Elaeocarpus reticulatus (I)	Blueberry Ash	2-6m
Dianella caerulea	Flax Lilly	Groundcover

Landscape Area G **Small feature tree and understorey planting**		
Botanical Name	**Common Name**	**Mature Height**
Lagerstroemia indica "Dwarf"	Crepe Myrtle	3-4m
Lomandra "Seascape" (N)	Fine Grey Lomandra	60cm
Correa alba (I)	Correa	1-1.5m
Eriostemon myopiroides	Wax Flower	1.5m
Landscape Area H **Boundary screening – 3m**		
Syzygium paniculatum "Dwarf" Select Form (N)	Dwarf Lilly Pilly	2-4m
Landscape Area I **Boundary screening at proposed boundary between proposed new Lots– 3m**		
Chamaedora seifrizii (E)	Bamboo Palm	2-3m
Drepanostachyum falcatum	Himalayan Weeping Bamboo	2-3m
Lomandra "Seascape" (N)	Fine Grey Lomandra	60cm
Landscape Area J **Continuation of existing boundary screening western boundary**		
Acmena smithii	Lilly Pilly	3-6m
Landscape Area K **Boundary screening east boundary adjacent to inclinator**		
Syzygium paniculatum "Dwarf" Select Form (N)	Dwarf Lilly Pilly	2-4m
Elaeocarpus reticulatus (I)	Blueberry Ash	2-6m
Landscape Area L **Pedestrian access to proposed new residence, weed control in support of natural regeneration with supplementary planting of native and indigenous groundcovers**		
Asplenium australacium (N)	Birds Nest Fern	1m
Blechnum cartilagineum	Blechnum	0.5m
Doodia aspera (I)	Rasp Fern	Groundcover
Lomandra longifolia (I)	Mat-rush	1m (Strapy)
Dianella caerulea	Flax Lilly	Groundcover
Landscape Area M above the 16m – 24m contour restoration and regeneration area with weed control and supplementary revegetation planting as required. Refer to Table 5		
Landscape Area N assisted regeneration area, weed control and replacement canopy tree planting as detailed.		
Canopy Tree planting minimum 3 Canopy Trees refer to Table 5 for suitable species		

Table 8. Endangered & vulnerable flora species known to occur in Pittwater Municipality to April 2007 (Atlas of NSW Wildlife)

Botanical Name	Common Name	Legal Status	Habitat / Occurrence	Surveyed @ site
Chamaesyce psammogeton	Coastal Spurge	E1	Coastal Foredunes Avalon Beach Palm Beach	No
Cryptostylis hunteriana	Leafless tongue Orchid	V	KCNP	No
Eucalyptus camfieldii	Heart-leaved stringybark	V	HSRW&H, Sandy lateritic soils. KCNP	No
Genoplesium baueri		V	Forest and Sheltered woodland Scotland Is.	No
Microtis angusii	Angus Onion Orchid	E1	DFVC Ingleside	No
Grevillea caleyi	Cayley's Grevillea	E1	DFVC, HSVC Terry Hills Duffy's Forest	No
Kunzea rupestris	Kunzea	V	HSRW&H KCNP	No
Syzygium paniculatum	Lily Pily	V	Rainforest including littoral rainforest Browns Bay Scotland Island Irrawong Res. Newport	Yes Planted
Persoonia hirsuta	Hairy Geebung	E1	HSRW&H, on Sandstone soils Ingleside	No
Pimelea curviflora	Curved Rice Flower	V	DFVC and ACW on sandstone soils. Narrabeen Lagoon	No
Tetratheca glandulosa		V	HSRW&H, DFVC Ingleside KCNP	No

DFVG = Duffys Forest Vegetation Community
HSRW & H = Hawkesbury Sandstone Rightop Woodland & Heath
ACW = Angophora Costata Woodland
KCNP = Ku ring gai Chase National Park

Table 9. Endangered & vulnerable fauna species known to occur in the Pittwater Municipality to April 2007 (Atlas of NSW Wildlife)

Scientific Name	Common Name	Legal Status	Suitable Habitat / Sightings	Suitable Habitat @ site
Arctocephalus pusillus	Australian Fur Seal	V	Marine	No
Burhinus grallarius	Bush Stone-curlew	E1	Eucalypt woodland with dry grassy understorey & Wetlands Careel Bay	No
Botaurus poicoptilus	Australasian Bittern	V	Dense wetland vegetation Narrabeen Lagoon, Deep Creek	No
Calyptorhynchus lathami	Glossy Black Cockatoo	V	Eucalypt Forest & Woodland with *Allocasuarina* sp. Western shores of Pittwater,	No
Cerartetus nanus	Eastern Pigmy Possum	V	Eucalypt Forest, Rainforest and Heath. KCNP	No
Chalinolobus dwyeri	Large-eared Pied Bat	V	Eucalypt Forests, Rainforest caves and mine shafts. St Michaels Cave North Avalon. Narrabeen.	Poss. 2ndary habitat. Possible periodic visitor only.
Chelonia mydas	Green Turtle	V	Marine	No
Dasyurus maculatus	Spotted-tailed Quoll	V	Eucalypt Forests and Woodlands. KCNP, GNP, Elvina Bay, Mona Vale, Avalon.	Poss. 2ndary habitat. Possible periodic visitor.
Dermochelys coriacea	Leathery Turtle	V	Marine	No

Scientific Name	Common Name	Legal Status	Suitable Habitat / Sightings	Suitable Habitat @ site
Diomedea exulans	Wandering Albatross	E1	Oceanic West Head	No
Eubalaena australis	Southern Right Whale	V	Marine	No
Haematopus fuliginosus	Sooty Oyster Catcher	V	Rock Platform, Beaches Bungan Head, Bangalley Head.	No
Haematopus longirostris	Pied Oystercatcher	V	Rock Platform, Beaches Careel Bay	No
Heleioporus australiacus	Giant Burrowing Frog	V	Moist Eucalypt Forests, Woodlands & Heath Ingleside, Narrabeen Creek, KCNP	No
Isodon obesulus	Southern Brown Bandicoot	E1	Dense vegetation – Forest, Woodland & Heath. KCNP, GNP	No
Ixobrychus flavicollis	Black Bittern	V	Timbered Watercourses in wetlands. Deep Creek, Warriewood Wetlands	No
Lathamus discolor	Swift Parrot	E1	Eucalypt Forests and Woodlands. Mona Vale, Ingleside, Bayview	No
Macronectes giganteus	Southern Giant Petrel	E1	Marine	No
Megaptera novaeangliae	Humpback Whale	V	Marine	No

Scientific Name	Common Name	Legal Status	Suitable Habitat / Sightings	Suitable Habitat @ site
Miniopterus schreibersii	Eastern Bentwing-bat	V	Range of habitats. Deep Creek, Ingleside, Bayview, Church Point, McKay Reserve, St Michaels Cave Avalon.	Poss. 2ndary habitat. Possible periodic visitor.
Neophema pulchella	Turquoise Parrot	V	Open Forests KCNP	No
Ninox connivens	Barking Owl	V	Eucalypt forests and woodlands. Church Point, Bayview, Bungan Beach, McKay Reserve.	Poss. 2ndary habitat. Periodic visitor.
Ninox strenua	Powerful Owl	V	Eucalypt Forests and Rainforests. Avalon, Deep Creek, KCNP,Scotland Island. Food small and medium sized mammals	Poss. 2ndary habitat. Periodic visitor.
Pandion haliaetus	Osprey	V	Coastal areas Narrabeen Lagoon, Trees (dead or living) near costal areas for nesting	No
Petalura gigantea	Giant Dragonfly	E1	Boggy Seepages and Swamps. Avalon	No

Scientific Name	Common Name	Legal Status	Suitable Habitat / Sightings	Suitable Habitat @ site
Phascolarctos cinereus	Koala	E2	Eucalypt Forests and woodlands Recent sightings Avalon, KCNP, Palm Beach, South to Gladstone Street	No
Pseudophryne australis	Red-crowned Toadlet	V	Moist Eucalypt Forest, Woodland & Heath, close to non-perennial streams. Deep Creek, Ingleside, Narrabeen Creek, KCNP, West Head	No
Pteropus poliocephalus	Grey- headed Flying Fox	V	Roost sites dense vegetation in Moist Gullies Feeding – variety of flowering and fruiting plants Church Point	Poss. 2ndary habitat. Periodic visitor.
Ptilinopus superbus	Superb Fruit Dove	V	Eucalypt Forests and Rainforests. Avalon	No
Scoteanax rueppellii	Greater Broad-nosed Bat	V	Eucalypt forests, woodlands and rainforests. Tree Hollows. Bilgola, Deep Creek.	Poss. 2ndary habitat. Periodic visitor.
Varanus rosenbergi	Roseenbergs Goanna	V	Eucalypt woodland & heath Ingleside, KCNP	No
Xanthomyza phygia	Regent Honeyeater	E1	Eucalypt Forests, Woodlands and Banksia Heath Avalon, Bayview, Warriewood	No

E1 = Endangered Species E2 = Endangered Population V = Vulnerable

Endangered Ecological Communities within Pittwater Council Municipality

Pittwater Spotted Gum Forest
Sydney Freshwater Wetlands
Sydney Costal Estuary Swamp Forest Complex
Duffy's Forest Vegetation Community in the Sydney Basin Bioregion
Coastal Salt Marsh
Littoral Rainforest
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner bioregions

Table 10. Significant plant species known to occur in the Pittwater Municipality

Botanical Name	Common Name	Habitat / Occurrence	Surveyed @ site
Abrophylum orans	Native Hydrangea	Rainforest slopes /gulleys	No
Acacia falcata	Sickle Wattle	Forest usually on shale soils (PSGF)	No
Acacia prominens	Gosford Wattle	Sheltered woodland on sandstone North of Hawkesbury river, Gosford	No
Acronychia oblongifolia	Common Acronychia	Rainforest gulleys & Forest on shale soils (PSGF, CTPF)	No
Alectryon subcinereus	Wild Quince	Rainforest and rainforest margins. Newport, Palm B each	No
Allocasuarina verticillata	Drooping She-oak	Exposed rocky cliffs in Woodlands on sandstone and shale soils. Mona Vale, Newport	No
Angophora crassifolia (*Baker*)	Narrow-leaved Apple	Woodland on sandstone KCNP, Bayview	No
Arthrochilus prolixus	Elbow Orchid	In Woodland on Sandstone. Lake Macquarie	No
Bertya brownii	Bertya	Sheltered woodland on sandstone soils. KCNP Katandra Reserve	No
Blechnum camfieldii	Blechnum	Rainforest gulleys & banks of creeks. Irrawong Reserve	No

Botanical Name	Common Name	Habitat / Occurrence	Surveyed @ site
Bossiaea prostrata		Health & Open Forest. Mona Vale	No
Callitris rhomboidea	Port Jackson Cypress	Open forest / gulleys on sandstone soils Church Point	No
Cassine australis	Red Olive Plum	Rainforest including littoral rainforest (PSGF, CTPF). Bayview, Scotland Island, Bilgola Beach	No
Craspedia variabilis		Stapleton Park	No
Cryptocarya microneura	Murrogun	Rainforest (PSGF, CTPF) Bayview, Clareville, Scotland Island.	No
Darwinia procera	Darwinia	Sheltered woodland on sandstone. Narrabeen	No
Daviesia umbellulate		McKay Reserve	No
Eriostemon buxifolius	Box-leaf Wax-flower	Health communities on sandstone. Turimetta Head	No
Eucalyptus capitellata	Brown Stringybark	Woodland on shallow infertile sandstone soils. Ingleside, KCNP	No
Eucalyptus luehmanniana	Yellow-top Ash	Woodland on sandstone of low fertility. KCNP, Ingleside	No
Eucalyptus robusta	Swamp Mahogany	Swampy sandstone based soils near estuaries and lagoons. Bayview, Warriewood Wetlands, Avalon Parade	No

Botanical Name	Common Name	Habitat / Occurrence	Surveyed @ site
Eucalyptus scias	Large-fruited Red Mahogany	Forest and woodland on sandstone ridges, and moist sheltered locations. McCarrs Creek, Church Point, Bilgola, Whale Beach.	No
Eupomatia laurina	Bolwarra	Rainforest and rainforest margins (PSGF, CTPF). Bayview, Bilgola Beach, McCarrs Creek, Scotland Island	No
Flagellaria indica	Whip Vine	Rainforest, Sydney southern limit	No
Guioa semiglauca	Guioa	Rainforest (PSGF, CTPF) Bayview, Church Point, Newport, Browns Bay	No
Logania pusilla		Woodland Shale soils	No
Pararchidendron pruinosum	Snow-wood	Rainforest McKay Reserve, Barrenjoey Headland, Crown of Newport Reserve	No
Persoonia isophylla		Woodland or Health on sandstone soils	No
Planchonella australis	Black Apple	Rainforest	No
Platysace clelandii		Open Forest, woodland on rocky ridges. Hornsby Plateau	No
Protanthera denticulata	Rough Mint-bush	Moist Forest and Woodland on sandstone and Narrabeen Shales. Bayview, Church Point, Scotland Island, Bungan Beach	No
Lomandra brevis	Tufted Mat-rush	Moist Open Heath / Woodland or dry sheltered forests on sandstone solis. Ingleside, Bayview	No

Botanical Name	Common Name	Habitat / Occurrence	Surveyed @ site
Pultenaea hispidula		Heath and Woodland on Sandstone. KCNP	No
Schizomeria ovata	Crabapple	Rainforest Bilgola Beach, Church Point, Browns Bay	No
Pomaderris sp. B	Pomaderris	Coastal Woodland on Sandstone and shale soils. Bushrangers Hill, Bungan Beach, Mona Vale Headland	No
Rulingia hermanifolia	Wrinkled Kerrawang	Coastal Heath Bangalley Head	No

Key
KCNP = Ku ring gai Chase National Park
PSGF = Pittwater Spotted Gum Forest
CTPF = Cabbage Tree Palm Forest
The above is a summary of information collected from DCP 25 Conservation of Biodiversity (Pittwater Council 2000), Pittwater Coastal Zone Flora and Fauna Study (Lembit and Burcher 1997), NPWS Atlas of NSW Wildlife 2005, Field Guide to the Native Plants of Sydney (Robinson, 1991), Native Plants of the Sydney District (Fairly and Moore 2000) and Personal Observation (Julia Stanton)

11.0 Appendix

Table 11 Significant fauna species known to occur in the Pittwater Municipality

Scientific Name	Common Name
Frogs	
Adelotus brevis	Tusked Frog
Uperoleia tyleri	Tyler's Toadlet
Reptiles	
Acanthophis antarcticus	Common Death Adder
Boiga irregularis	Brown Tree Snake
Dendrelaphis punctulata	Green Tree Snake
Egernia cunninghamii	Cunningham's Skink
Morelia spilota	Diamond Python
Notechis scutatus	Eastern Tiger Snake
Pogona barbata	Bearded Dragon
Pseudonaia textilis	
Varanus varius	Lace Monitor
Birds	
Acanthiza chrysorrhoa	Yellow Rumped Thornbill
Accipiter cirrhocephalus	Collared Sparrowhawk
Accipiter fasciatus	Brown Goshawk
Accipiter novaehollandiae	Grey Goshawk
Aegotheles cristatus	Australian Owlet-nightjar
Alcedo azurea	Azure Kingfisher
Alectura lathami	Australian, Brush-turkey
Aquila audax	Wedge-tailed Eagle
Aviceda subcristata	Pacific Baza
Butorides striatus	Striated Heron
Calidris ruficollis	Red-necked Stint
Calyptorhynchus funereus	Yellow-tailed Black Cockatoo
Centropus phasianinus	Pheasant Coucal
Climacteris picumnus	Brown Treecreeper
Daphoenositta chrysoptera	Varied Sittella
Egretta sacra	Eastern Reef Egret
Eudyptula minor	Little Penguin

Scientific Name	Common Name
Falco peregrinus	Peregrine Falcon
Geopelia humeralis	Bar-shouldered Dove
Geopelia striata	Peaceful Dove
Gerygone levigaster	Mangrove Greygone
Gerygone olivacea	White-throated Gerygone
Glossopsitta concinna	Musk Lorikeet
Haliaeetus leucogaster	White bellied Sea Eagle
Haliastur sphenurus	Whistling Kite
Heteroscelus brevipes	Grey-tailed Tattler
Hieraaetus morphnoides	Little Eagle
Ixobrychus minutus	Little Bittern
Lichenostomus fuscus	Fascous Honeyeater
Limosa lapponica	Bar-tailed Godwit
Lopholaimus antarcticus	Topknot Pigeon
Macropygia amboinensis	Brown Cuckoo-Dove
Melithreptus gularis	Black-chinned Honeyeater
Menura novaehollandiae	Superb Lyrebird
Monarcha melanopsis	Black-faced Monarch
Myiagra rubecula	Leaden Flycatcher
Numenius madagascariensis	Eastern Curlew
Numenlus phaeopus	Whimbrel
Origma solitaria	Rock Warbler
Pachycephala rufiventris	Rufous Whistler
Petroica rosea	Rose Robin
Phaps elegans	Brush Bronzewing
Pitta versicolor	Noisy Pitta
Ptilonorhynchus violaceus	Satin Bowerbird
Rallus pectoralis	Lewin's Rail
Rhipidura rufifrons	*Rufous Fantail*
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet
Mammals	
Acrobates pygmaeus	Feathertail Glider
Antechinus stuartii	Brown Antechinus

Scientific Name	Common Name
Chalinolobus morio	Chocolate Wattle Bat
Isoodon macrourus	Northern Brown Bandicoot
Nyctinomus australis	White-striped Freetail-bat
Ornithorhynchus anatinus	Platypus
Perameles nasuta	Long-nosed Bandicoot
Petaurus breviceps	Sugar Glider
Rattus fuscipes	Bush Rat
Tachyglossus aculeatus	Short-beaked Echidna
Wallabia bicolor	Swamp Wallaby

Habitat and distribution of endangered or vulnerable fauna, which are known or likely to occur in similar habitat in the Pittwater Council Municipality.

A brief overview of each species of endangered or vulnerable fauna, which has known habitat requirements in the general area has been included.

The overview is a summary of information collected from DCP 25 Conservation of Biodiversity (Pittwater Council 2000) and Management Plan for Threatened Fauna and Flora in Pittwater (Smith and Smith 2000).

Glossy Black Cockatoo

Status: The Glossy Black Cockatoo is listed as a vulnerable species in NSW under the Threatened Species Conservation Act 1995.
Distribution: From Eungella in Queensland along the coastal ranges and western slopes of NSW to Gippsland and the Central Highlands of Victoria.
Known distribution / occurrence in Pittwater: Glossy Black Cockatoos have been widely reported in Pittwater, sightings include Bayview, Church Point, Deep Creek, Browns Bay, Ingleside, Scotland Island, Western Shores of Pittwater and KCNP.
Habitat: Eucalypt Forest and Woodland birds will travel in search of food.
Nesting: Suitable nesting hollows in mature dead or living Eucalypts. Hollows of this size do not usually form in Eucalypt Trees < 200 years old. Breeding likely in larger more secluded areas of Bushland.
Roosting: Shelter in Large dead or living trees with Large Hollows
Foraging / feeding: The main food source for these animals is the fruit produced by female *Allocasuarina torulosa* and *Allocasuarina littoralis*. Birds will also feed on *Casuarina glauca* and *Allocasuarina dystyla.*
Comment: There were no potential roosting or nesting sites or known food trees identified on this property.

Spotted-tailed Quoll *(Dasyurus maculatus)*

Status: Listed as a Vulnerable species in NSW.
Distribution: Southeastern Queensland through NSW, to Western Victoria and Tasmania.
Pittwater Population: There have been a number of recorded sightings of the Spotted-tiger Quoll in the Pittwater area, including Ku ring gai Chase and Garigal National Parks, Elanora Heights, Katandra Bushland Sanctuary and Avalon.
Habitat: The Spotted-tiger Quoll is found in a variety of habitats, including sclerophyll forest and woodland, heath and rainforest.
Feeding: The Spotted-tiger Quoll is known to have a large home range, where it hunts for food. It preys on a variety of native and introduced mammals, birds and reptiles (Smith and Smith, 2000). The most important prey is the Rabbit, Bandicoot and Brushtail and Ringtail Possum.
Comments: This species is highly mobile. The Spotted Tiger Quoll may utilise habitat at this property for foraging for prey (small mammals and birds). The proposed development does not impact on primary habitat for this species.
Powerful Owl
Status: The Powerful Owl is listed as a vulnerable species in NSW.
Distribution: The Powerful Owl is endemic to the forests of south-eastern mainland Austraila.
Known Distribution / occurance in Pittwater:

There has been an increase in sightings in both the Pittwater area and throughout Sydney over the last ten years. Sightings have been recorded at Bungan Beach, Newport, McCarrs Creek, Church Point and Narrabeen Creek (Smith & Smith, 2000).
Habitat: Breeding pairs have large territories and generally occur in tall, Eucalypt forests, but also in rainforest. They nest in large hollows in mature live Eucalypts. They roost in dense tall vegetation usually in gullies.
Feeding: The Powerful Owl feeds on small to medium sized mammals, birds and insects. It is thought that increased sightings of the Powerful Owl in urban areas of Pittwater is related to the increase in abundance of some prey including small – medium mammal species Ringtailed Possums and Bandicoots.
Comments: This species is highly mobile. There were no potential roosting or nesting sites identified on this property. The powerful Owl may utilise habitat at this site for foraging for prey. The proposed development does not impact on primary habitat for this species.

Grey-headed Flying Fox

Status: The Grey-headed Flying Fox is listed as a vulnerable species on Schedule 2 of the *Threatened Species Act, 1995.*
Distribution: The species occurs on the eastern coastal plain from Bundaberg to eastern Victoria.
Known Distribution / occurrence in Pittwater: Grey-headed flying fox has been observed feeding on the fruit of indigenous, native and exotic Fig Trees and Palms throughout the municipality.

Habitat: The species is a frugivore, blossom-eater and nectarivore.

Comments: The species is highly mobile and may periodically utilise the habitat at this site to feed. The proposed development will not have a significant impact on the habitat of the Grey-headed Flying Fox.

Barking Owl
Status: The Barking Owl is listed as a vulnerable species in NSW.
Distribution: The species is widely distributed over mainland Australia.
Known Distribution / occurrence in Pittwater:
There have been a number of recordings in Avalon, Palm Beach, Bayview and Scotland Island over the last few years.
Habitat: The Barking Owl inhabits eucalypt forests and woodland.
Feeding - It is a generalised nocturnal predator, with adaptable diet according to availability of prey (Birds, Mammals and Insects).
Roosting – Birds roost by day in densely foliaged tall trees or large shrubs
Nesting - Barking owls are dependant on large hollows in old eucalyptus for nest sites with a preference for hollows in live trees rather than dead trees.
Comments: This species is highly mobile. There were no potential nesting sites identified on this property. The Barking Owl may utilise habitat at this site for foraging for prey. The proposed development does not impact on primary habitat for this species. Primary habitat for this species is located in Kuring-gai National Park.

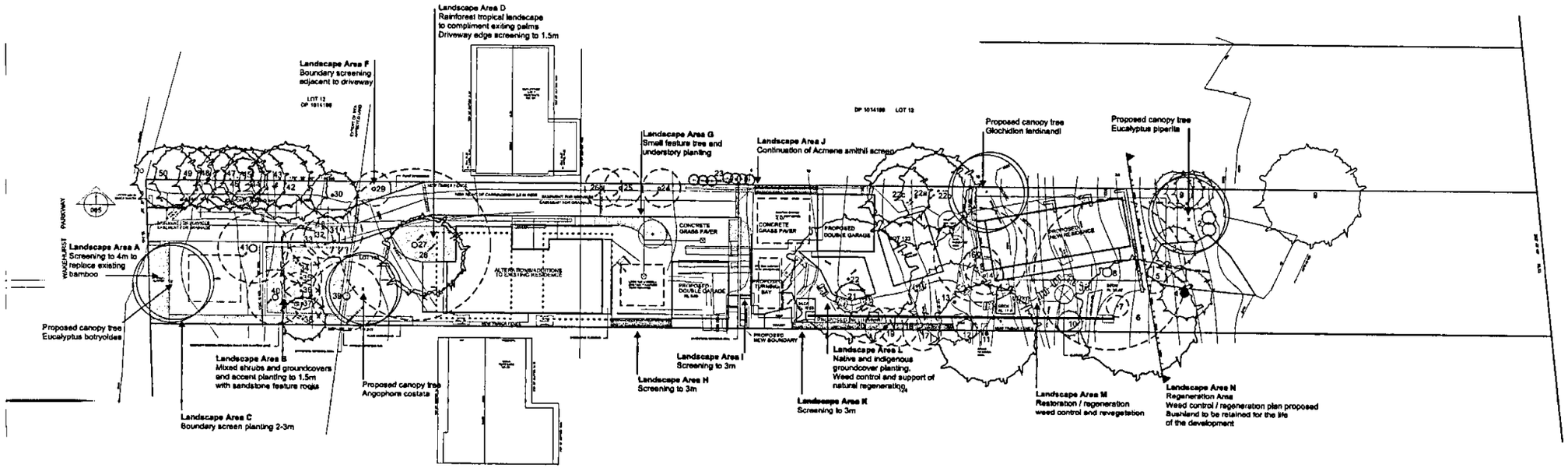
Common Bent Wing Bat
Status: Listed as a Vulnerable species in NSW.

Distribution: A wide distribution including, Australia, New Guinea & Indo-Malayan archipeligo. Sub species oceanensis occurs along the coast and ranges, from north queensland to the far south-eastern corner of South Australia.
Pittwater Population: Calls have been recorded from St Michaels Cave North Avalon.
Habitat: Recorded in a wide range of habitats from grasslands to subtropical rainforests, but typically found in well-timbered valleys.
Feeding: Insects above the vegetation canopy.
Roosts: Day time roosts include caves, mine shafts, stormwater pipes.
Comments: Micro bats may forage for insects among or above the tree canopy. The vegetation to be retained may provide potential foraging habitat for this species. Micro bats may forage for insects among or above the tree canopy.

Large-eared Pied Bat
Status: Listed as a Vulnerable species in NSW.
Distribution: Recorded from scattered localities in eastern Australia from Rockhampton in Queensland to Bungonia in southern NSW.
Pittwater Population: Calls have been recorded from St Michaels Cave North Avalon.
Habitat: Large-eared Pied Bat has been recorded a range of habitats from dry to wet Eucalypt Forests, sub-alpine woodland and sandstone outcrop country.
Feeding: Probably feeds on small flying insects below the forest canopy.
Roosts: Day time roosts include caves, mine shafts
Comments: Micro bats have forage for insects among the tree canopy. The vegetation to be retained at this site may provide potential foraging habitat for this species.

Greater Broad-nosed Bat

Status: The Greater Broad-nosed Bat is listed as a vulnerable species in NSW.
Distribution: It is restricted in distribution to the east coast of Australia and adjacent areas of the Great Dividing Range.
Pittwater Population: The species has been recorded at Bilgola and Deep Creek Reserve.
Habitat: The species occurs in a variety of habitats, including eucalypt forests, woodland and rainforest.
Roosting: Usually roosts and nests in tree hollows in eucalypts.
Feeding: A varied insectivorous and carnivorous diet. It forages along natural and man-made flyways such as roads, creeks and small rivers.
Comments: The vegetation to be retained at this site may provide potential foraging habitat for this species.



Notes

All indigenous trees to be retained and the area of vegetation to the north of the proposed new dwelling have been identified as significant vegetation / bushland to be retained for the life of the development (Trees and vegetation to be maintained in accordance with Pittwater Councils Tree Preservation Order).

Tree and vegetation protective fencing required prior to commencement of site works. Refer to Arborists report for Tree Protection and Management details

Landscape planting is proposed in areas where natural regeneration is considered limited and / or where plant material is to be used to address functional requirements such as screening.

The indicative plant and revegetation schedules and landscape /ecologically sustainabilty plan (Table 6 and 7) have been developed to address the aims of development controls, specifically providing adequate screening, habitat creation, replacement canopy tree planting, while maintaining adequate solar access and complying with bushfire protection recommendations

Legend

- Existing trees to be retained
- Existing trees proposed for removal
- Proposed Trees
- Exclusion Fencing
- Material and soil storage area

Landscape and Ecological Sustainability Concept Plan
100 Wakehurst Parkway
Scale 1:400 @ A3
Syncarpia Vegetation Management
May 2007

Figure 1

Photo 1. View north from southern boundary along existing drive

Photo 2. View southeast from existing drive existing landscape Tree 31 and 32 in foreground Bamboo along southern boundary

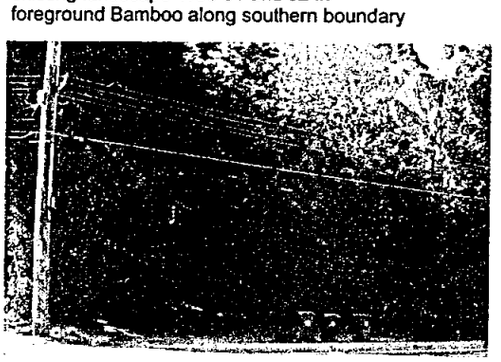


Photo 3. View north from Wakehurst Parkway Bamboo along southern boundary

Photo 4. View south Tree 30 on right

Photo 5. View east from existing driveway existing landscape area

Photo 6. View north east from existing driveway existing dwelling and landscape area

Photo 7. View north east \existing garage

Site Photos Lot 1
100 Wakehurst Parkway
Elanora Heights
Syncarpia Vegetation Management
May 2007

Figure 2

Photo 1. View north of proposed Lot 2

Photo 2. View south Tree 13 in foreground

Photo 3. View north location of proposed new dwelling

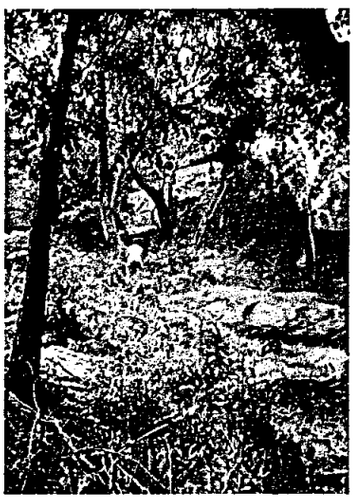


Photo 4. View north location of proposed new dwelling

Photo 5. Existing bushland below rock escarpment

Photo 6. View south location of proposed dwelling Trees 14, 14 and 16 in background

Site Photos Lot 2
100 Wakehurst Parkway
Elanora Heights
Syncarpia Vegetation Management
May 2007

Figure 3

CONSTRUCTION OF DWELLINGS IN BUSHFIRE-PRONE AREAS

LEVEL 1 CONSTRUCTION in compliance with AS 3959-1999

FLOORING SYSTEM – Concrete slab on ground or suspended concrete floor

SUPPORTING POSTS – Timber mounted on galvanised metal shoes greater than 75mm above ground level.

EXTERNAL WALLS – External leaf of masonry and/or framed walls with breather type sarking complying with AS 4200.1 installed immediately behind the external cladding

WINDOWS – All openable windows shall be screened with corrosion resistant aluminium mesh with a maximum aperture size of 1.8mm.

EXTERNAL DOORS – To be fitted with weather strips or draught excluders and tight fitting door screens of aluminium mesh with a maximum aperture of 1.8mm.

VENTS AND WEEPHOLES – Shall be protected with spark guards maximum aperture of 1.8mm

ROOFS – Roof/wall junction to be sealed by the use of fascia and eaves lining, sarking shall have a flammability index of not more than 5. Fully sark tiled roof.

EAVES – Shall be enclosed, and the gaps between the fascia and rafters sealed.

FASCIA – No requirements in Level 1 construction.

GUTTERS AND DOWNPIPES – Any material used to stop leaves collecting in gutters shall have a flammability index of not greater than 5.

VERANDAHS AND DECKS – concrete slab to ground floor deck, minimum spacing to decking timbers of 5mm to other decks.

SERVICE PIPES – All exposed pipes for water and gas supplies shall be metal, pipes of other materials shall be buries to a minimum of 300mm.

SECTION 3 BUILDING CONSTRUCTION

3.1 GENERAL

This Section sets out the requirements for the construction of various elements of a building in order to reduce the likelihood of ignition of that building when subjected to bushfire attack.

3.2 LEVELS OF CONSTRUCTION

A1 Three levels of construction are given which correspond to the category of bushfire attack determined for the site of the building (see Section 2):

(a) *Level 1 construction* For the category of medium bushfire attack.

(b) *Level 2 construction* For the category of high bushfire attack.

A1 (c) *Level 3 construction* For the category of extreme bushfire attack.

NOTES:

1 For the category of low bushfire attack, the degree of bushfire attack is considered insufficient to warrant specific construction requirements.

A1

3.3 FLOORING SYSTEMS

3.3.1 Level 1 construction

The requirements for a floor in a Level 1 construction shall be one, or a combination, of the following:

(a) A concrete slab-on-the-ground.

(b) A suspended floor, which may be one, or a combination of the following, supported by posts, columns, stumps, piers or poles complying with Clause 3.4 or walls complying with Clause 3.5:

(i) A concrete floor.

(ii) A framed floor where the underside of any one bearer at any point is greater than 600 mm above the finished ground level.

(c) A suspended timber floor, framed with timber or metal, where the underside of any one bearer, at any point, is not greater than 600 mm above the finished ground level and which has—

(i) the subfloor space unenclosed and any timber flooring, bearers and joists of fire-retardant-treated timber; or

(ii) the subfloor space fully enclosed, either by a wall that complies with Clause 3.5.1(a), or by the use of non-combustible sheet material which extends for at least 400 mm above the finished ground level.

Where non-combustible fibre-reinforced cement sheets are used to enclose the subfloor space, the material shall have a minimum thickness of 6 mm and all joints shall be covered or sealed (see Figure 3.1). The non-combustible sheet material shall meet the bottom of the cladding material to ensure there are no gaps on the exterior face of the building.

C3.3.1 The following comments refer to the specific items noted and apply to the need to prevent the entry of burning debris to the subfloor space:

*(a) **Subfloor space** It is generally agreed that there is a need to completely enclose subfloor spaces close to the ground as they are prone to attack from burning debris. The chosen cut-off distance of 600 mm from the finished ground level to the underside of the lowest structural member is intended to represent the height below which access to extinguish burning debris would be difficult. In such cases of reduced accessibility, the 400 mm high barrier is intended to prevent the entry of burning debris to the subfloor space.*

*(b) **Sheeting of the underside of suspended floors** There are a number of opinions concerning the ignition risks presented by exposed subfloors. One opinion is that bearers and joists pose few problems because they are large in section. Another opinion is that the underside of suspended floors should be clad with non-combustible cement sheet or equivalent material on the underside of the floor joists or on top of the joists and under the floorboards, to prevent wind-borne burning debris from contacting the floors. Although sheeting the underside can cause ventilation difficulties, it could help protect the floor in cases where items stored in the underfloor space are ignited. Such housekeeping measures were considered, however, to be outside the scope of this Standard and in view of the potential difficulties and additional cost involved, sheeting requirements are not included for Level 1 construction.*

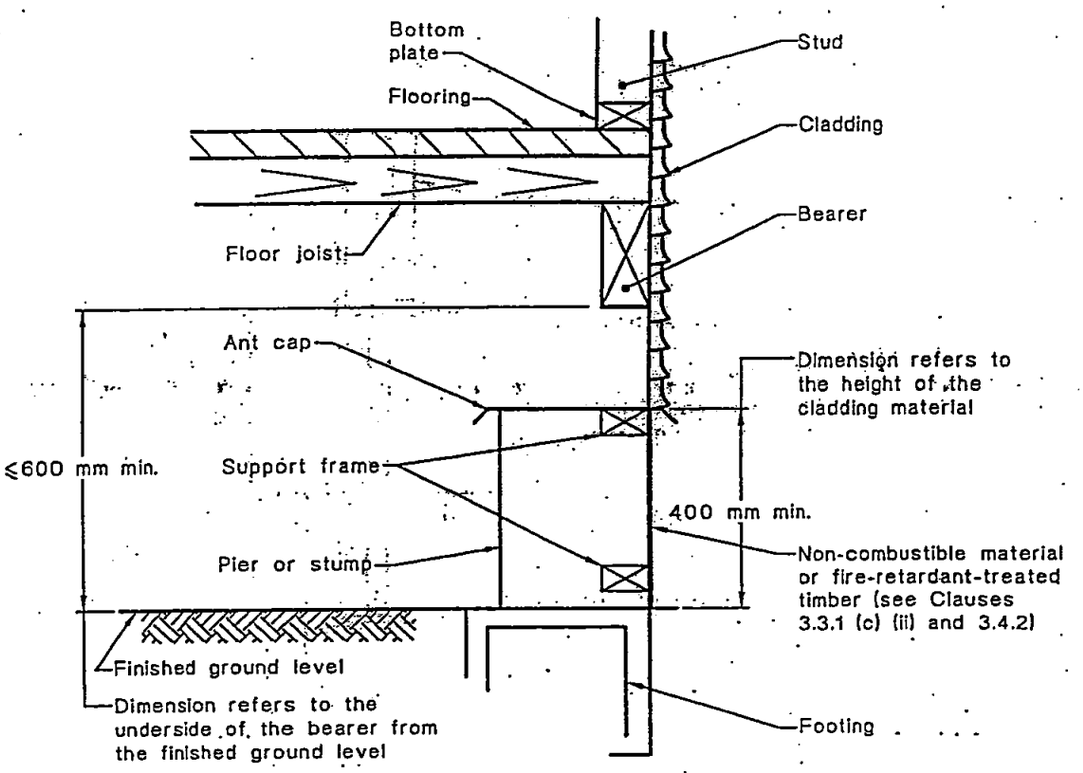
3.3.2 Level 2 construction

The requirements for a floor in a Level 2 construction shall be as for Level 1 construction (see Clause 3.3.1).

NOTE: The protection of subfloor openings against the entry of burning debris by way of introducing non-combustible material, such as fibre-reinforced cement sheeting to effectively enclose the subfloor space, may conflict with the requirements for termite protection and should therefore, take into consideration the provisions of AS 3660.1.

A1 ### 3.3.3 Level 3 construction

The requirements for a floor in a Level 3 construction shall be as for Level 2 construction (see Clause 3.3.2) except that in the case of a framed floor, where any bearer or joist is greater than 600 mm above finished ground level and the floor is not enclosed as described in Clause 3.3.1(c)(ii), the bearer, joists and flooring shall be of fire-retardant-treated timber or sheeted underneath with non-combustible material.



NOTES:

1 Provision for termite protection should be in accordance with AS 3660.1.

2 Provision should be made for adequate ventilation.

FIGURE 3.1 PROTECTION OF SUBFLOOR SPACE FOR STRUCTURES WITH RESTRICTED SUBFLOOR ACCESSIBILITY

3.4 SUPPORTING POSTS, COLUMNS, STUMPS, PIERS AND POLES

3.4.1 Level 1 construction

The requirements for supporting posts, columns, stumps, piers and poles in a Level 1 construction shall be one, or a combination, of the following:

(a) Non-combustible.

(b) Fire-retardant-treated timber for a minimum of 400 mm above the finished ground level.

(c) Timber mounted on galvanized metal shoes with a clearance of not less than 75 mm above the adjacent finished ground level or paving level (see Figure 3.2).

The above do not apply where the subfloor space is totally enclosed as described in Clause 3.3.1(c) (ii).

3.4.2 Level 2 construction

The requirements for supporting posts, columns, stumps, piers and poles in a Level 2 construction shall be as for Level 1 construction (see Clause 3.4.1).

A1 **3.4.3 Level 3 construction**

Except in enclosed subfloor spaces, the requirements for supporting posts, columns, stumps, piers and poles in a Level 3 construction shall be as for Level 2 construction (see Clause 3.4.2) except that all timber shall be fire-retardant-treated to full height.

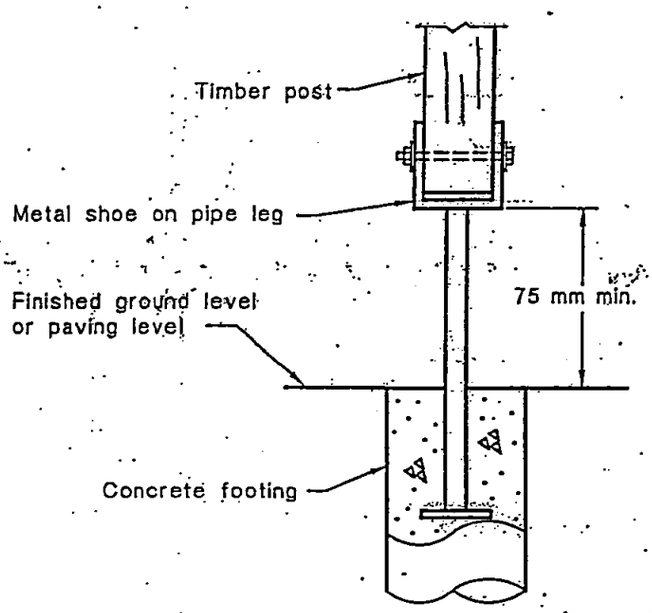


FIGURE 3.2 GALVANIZED METAL SHOE DETAIL

3.5 EXTERNAL WALLS

3.5.1 Level 1 construction

The requirements for external walls in a Level 1 construction shall be as follows:

(a) External walls shall be one, or a combination, of the following:

(i) A wall having an external leaf of masonry, concrete, pisé, rammed earth or stabilized earth.

(ii) A framed wall that incorporates either—

(A) breather-type sarking complying with AS/NZS 4200.1 and with a flammability index of not more than 5 (see AS 1530.2) installed immediately behind the external cladding; or

(B) an insulation material conforming to the appropriate Australian Standard for that material.

NOTE: No restrictions apply to the cladding material.

(iii) A wall of timber logs that have the butting faces of adjacent logs, gauge-planed, and the space between the logs sealed in a manner that prevents the entry of burning debris and which allows for building movement.

C3.5.1(a)(iii) There is little field evidence on the performance of timber log construction under attack from burning debris. The requirements for gauge-planing and sealing are considered necessary to prevent the passage of burning debris to the interior of the building.

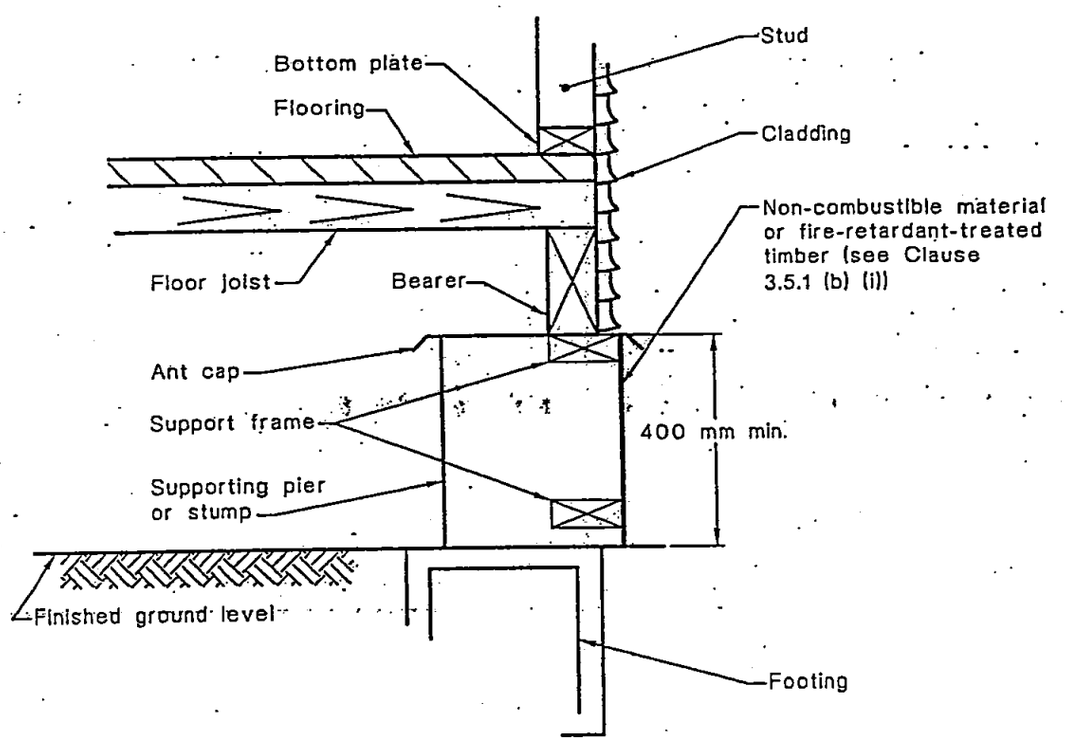
(b) Where the external leaf or cladding is of a combustible sheet material and is less than 400 mm above finished ground level, the cladding shall be protected for not less than 400 mm above the adjacent finished ground level (see Figure 3.3)—

(i) by covering it with a suitable non-combustible material, or fire-retardant-treated timber suitably sealed to the existing cladding so as to prevent the entry of burning debris (see Figures 3.3(a) and 3.3(b));

(ii) by substituting with a suitable non-combustible sheet material, or fire-retardant-treated timber (see Figure 3.3(c)); or

(iii) where the external cladding is timber, by using fire-retardant-treated timber.

C3.5.1(b) Combustible cladding is acceptable, but as for support posts, columns, stumps, piers and poles (see Clause 3.4), protection is required to 400 mm above the finished ground level. Protection would normally only be necessary with concrete slab-on-the-ground construction as it would be simpler to raise the floor level of a suspended floor and protect the subfloor area (see Clause 3.3.1(c) and Figure 3.3(a)).

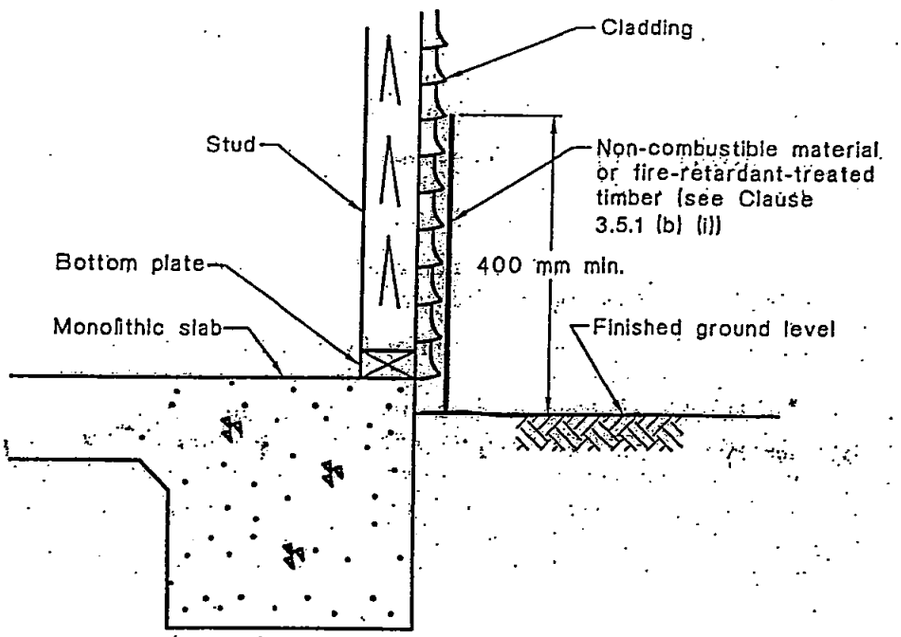


NOTES:

1 Provision for termite protection should be in accordance with AS 3660.1.

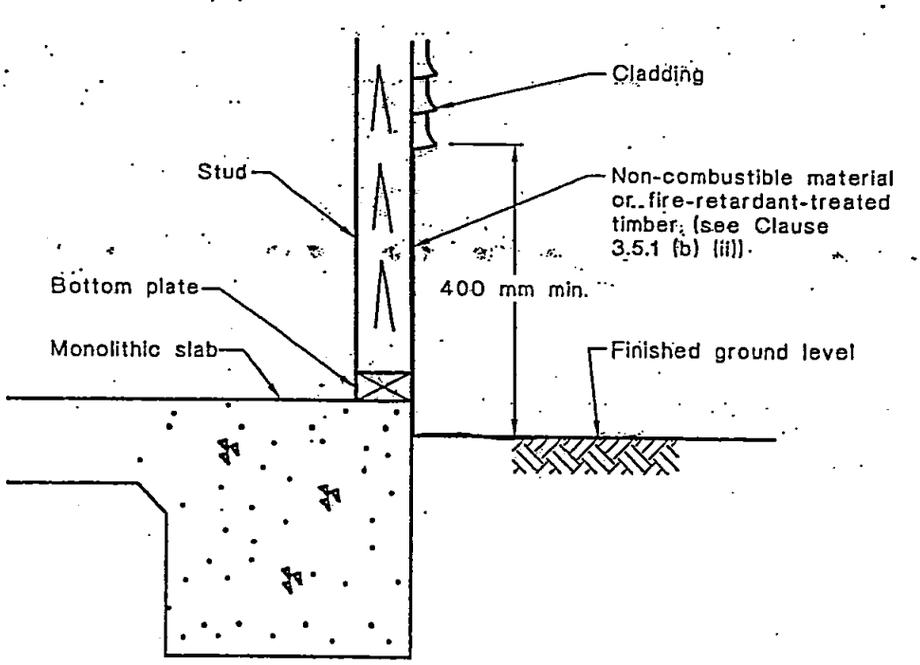
2 Provision should be made for adequate ventilation.

FIGURE 3.3(a) WALL CLADDING—COVERING TIMBER SUSPENDED FLOOR



NOTE: Provision for termite protection should be in accordance with AS 3660.1.

FIGURE 3.3(b) WALL CLADDING—COVERING SLAB-ON-THE-GROUND



NOTE: Provision for termite protection should be in accordance with AS 3660.1.

FIGURE 3.3(c) WALL CLADDING—SUBSTITUTE MATERIAL SLAB-ON-THE-GROUND

3.5.2 Level 2 construction

The requirements for walls in a Level 2 construction shall be as for Level 1 construction (see Clause 3.5.1), except that PVC cladding is not permitted and all external timber wall cladding shall be of fire-retardant-treated timber.

A1 | ### 3.5.3 Level 3 construction

The requirements for external walls in a Level 3 construction shall be as for Level 2 construction (see Clause 3.5.2).

3.6 WINDOWS

3.6.1 Level 1 construction

All openable windows, including louvres, in a Level 1 construction shall be screened with corrosion-resistant steel, bronze or aluminium mesh with a maximum aperture size of 1.8 mm in such a way that the entire opening remains screened when the window is open.

C3.6.1 A maximum aperture size of 1.8 mm was selected for mesh to be used as screening in order to facilitate the use of the screen as an insect-screen.

A1 | ### 3.6.2 Level 2 construction

The requirements for all windows, including louvres, in a Level 2 construction shall be as for Level 1 construction (see Clause 3.6.1) except that aluminium mesh shall not be used.

In addition to the above, the following applies:

(a) Where timber is used, it shall be fire-retardant-treated timber except where protected by non-combustible shutters.

(b) Where leadlight windows are used, they shall be protected by shutters constructed of a non-combustible material or of toughened glass.

A1 | ### 3.6.3 Level 3 construction

The requirements for windows in a Level 3 construction shall be as for Level 2 construction (see Clause 3.6.2) except that where the windows are not protected by non-combustible shutters, they shall be glazed with toughened glass.

3.7 EXTERNAL DOORS

3.7.1 Level 1 construction

External doors in a Level 1 construction shall be fitted with—

(a) weather strips or draught excluders to prevent the penetration or build-up of burning debris beneath the door; and

(b) tight fitting door screens fitted with corrosion-resistant steel, bronze or aluminium mesh with a maximum aperture size of 1.8 mm.

C3.7.1 A maximum aperture size of 1.8 mm was selected for mesh to be used as screening in order to facilitate the use of the screen as an insect-screen.

3.7.2 Level 2 construction

A1 | The requirements for external doors in a Level 2 construction shall be as for Level 1 construction except that aluminium shall not be used for the mesh (see Clause 3.7.1). If leadlight glazing panels are incorporated in the doors, they shall be protected by shutters constructed of a non-combustible material or of toughened glass.

A1 **3.7.3 Level 3 construction**

The requirements for external doors in a Level 3 construction shall be as for Level 2 construction (see Clause 3.7.2) except that—

(a) timber doors shall be fire-retardant-treated or shall have a non-combustible covering on the exterior surface; or

(b) doors shall be protected by shutters of non-combustible material; or

(c) doors shall be solid-core having a thickness not less than 35 mm.

3.8 VENTS AND WEEPHOLES

3.8.1 Level 1 construction

Vents and weepholes in a Level 1 construction shall be protected with spark guards made from corrosion-resistant steel, bronze or aluminium mesh with a maximum aperture size of 1.8 mm (see Figure 3.4).

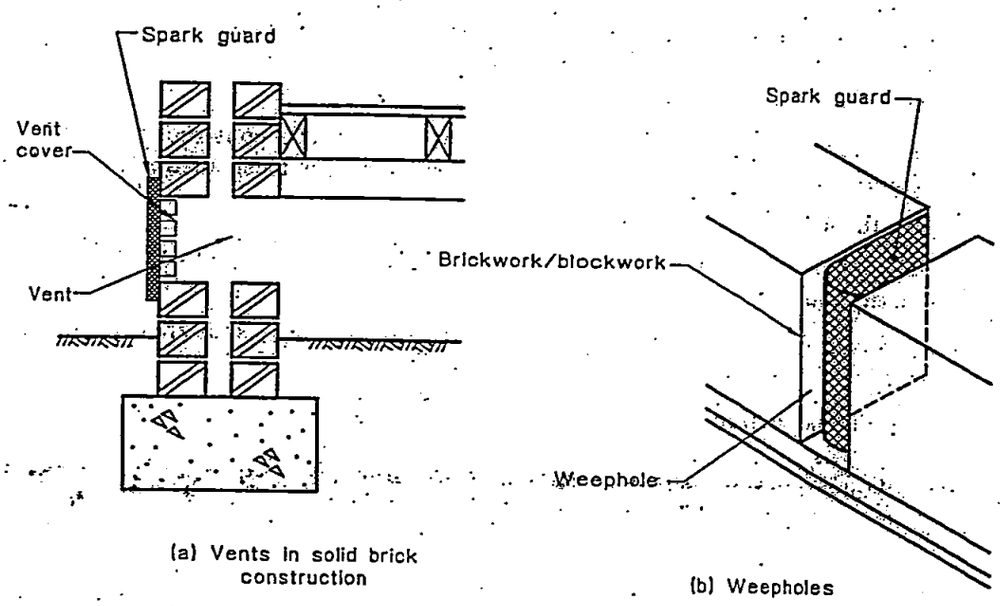


FIGURE 3.4 VENTS AND WEEPHOLES

3.8.2 Level 2 construction

The requirements for Level 2 construction vents and weepholes shall be as for Level 1 construction (see Clause 3.8.1), except that aluminium mesh shall not be used.

A1 **3.8.3 Level 3 construction**

The requirements for vents and weepholes in a Level 3 construction shall be as for Level 2 construction (see Clause 3.8.2).

3.9 ROOFS

3.9.1 Level 1 construction

3.9.1.1 *General*

The following general requirements shall apply to all types of roofing systems in a Level 1 construction:

(a) Timber shakes or shingles shall not be used for the roof covering.

(b) The roof/wall junction shall be sealed either by the use of fascias and eaves linings, or by sealing the gaps between the rafters with a suitable non-combustible material.

(c) Sarking shall have a flammability index of not more than 5 (see AS 1530.2).

3.9.1.2 *Tiled roofs*

Tiled roofs shall be fully sarked (see Clause 3.9.1.1(c). The sarking shall be located directly below the tiling battens and shall cover the entire roof area including the ridge.

C3.9.1.1 and C3.9.1.2 Where roofing systems are fully sarked, effectively restricting or excluding airflow, it may be necessary to provide ventilation to prevent moisture (condensation) from occurring in the roof space. If roof vents need to be provided to address moisture, they need to be sealed, to protect against the entry of sparks and embers, with corrosion-resistant resistant steel or bronze mesh having a maximum aperture size of 1.8 mm.

3.9.1.3 *Sheeted roofs*

The requirements for sheeted roofs in a Level 1 construction are as follows:

(a) Only metal or fibre-cement sheet shall be used.

(b) All gaps under the corrugations or ribs of the roofing material where it meets the fascia or wall line shall be sealed or protected—

(i) by fully sarking the roof; or

(ii) by providing corrosion-resistant steel or bronze mesh, with a maximum aperture size of 1.8 mm, profiled metal sheet, neoprene seal, compressed mineral wool or similar material.

NOTES:

1 The method of protection in Item (b)(ii) can only be achieved on a roof without valleys and having the deck fixed directly to, but not structurally supported by, the fascia.

2 It is generally recognized that where compressed mineral wool is used for sealing against bushfire attack or for other purposes, adequate ventilation should be provided to stop condensation on the mineral fibre causing corrosion in the roof sheeting or supporting structure.

(c) Rib caps and ridge capping shall be sealed in accordance with Clause 3.9.1.3(b) (see Figure 3.5(a)), or preformed rib caps or ridge capping shall be used (see Figures 3.5(b) and (c).

3.9.1.4 *Rooflights*

The requirements for rooflights in a Level 1 construction are as follows:

(a) All penetrations of the roof space for the installation of rooflights and associated shafts shall be sealed with a non-combustible sleeve or lining.

Thermoplastic sheet in a metal frame may be used for a rooflight, but the diffuser installed at ceiling level shall be of wired or toughened glass in a metal frame.

NOTE: AS 1288 and AS 4285 sets out specific requirements for glazing and skylights.

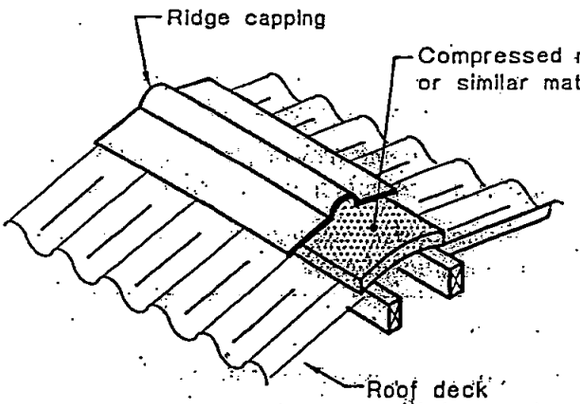
(b) Vented rooflights shall be provided with corrosion-resistant steel or bronze mesh having a maximum aperture size of 1.8 mm.

3.9.1.5 *Roof ventilators*

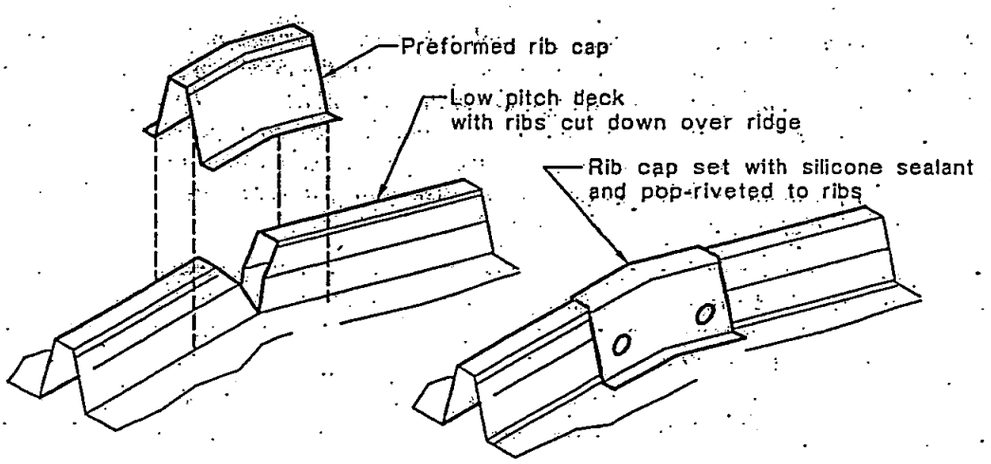
All components of roof ventilators, including the rotary type, in a Level 1 construction shall be constructed of non-combustible material and shall be sealed against the entry of sparks and embers with corrosion-resistant steel or bronze mesh having a maximum aperture size of 1.8 mm.

3.9.1.6 *Roof-mounted evaporative cooling units*

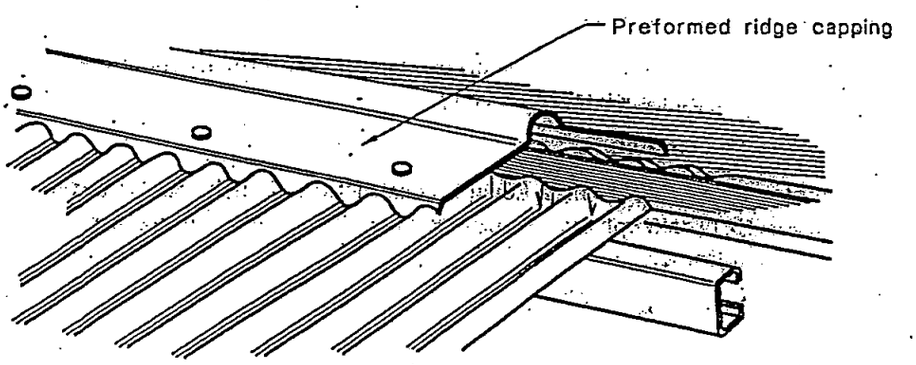
Roof-mounted evaporative cooling units shall only be used if the openings to the cooling unit are encased in corrosion-resistant steel or bronze mesh with a maximum aperture size of 1.8 mm.



(a) Ridge capping over compressed insulation



(b) Continuous metal deck roofing with ribs cut and capped



(c) Preformed ridge capping

FIGURE 3.5 RIDGE AND RIB PROTECTION FOR SHEETED ROOFS

Figure 3.5

Figure 3.5(a) The ridge capping over compressed insulation is used when the ridge cap is not formed to the profile of the sheeting material.

Figure 3.5(b) The continuous metal deck roofing with ribs cut and capped is a typical roof plumbing detail and is not specific to fire-resistant construction.

Figure 3.5(c) The preformed ridge capping depicts the use of a profiled ridge capping and is recommended for low-pitched roofs.

3.9.2 Level 2 construction

The requirements for a roof in a Level 2 construction shall be as for Level 1 construction (see Clause 3.9.1), except that all roof sheeting shall be non-combustible and sarked, and rooflight glazing shall be of wired glass. Thermoplastic material or toughened glass shall not be used as the glazing for rooflights. The case of the evaporative cooler shall be manufactured from a non-combustible material.

C3.9.2 Assemblies such as awnings, pergolas, blinds, coverings and shades, designed to provide shelter to persons, or protect the building from the effects of sun or rain, are not covered by this Standard. The awnings, or similar assemblies, may be located in front of a window or door or over a balcony or deck and may be constructed from metal or a combustible material such as canvas or a thermoplastic material. These assemblies may be fixed or retractable. Awnings and similar assemblies, in many cases, may be added to the building after construction is completed.

Building designers and building owners should be aware that potential dangers may be present where the awning or similar assembly is made from a combustible material.

A1 | ### 3.9.3 Level 3 construction

The requirements for roof covering in a Level 3 construction shall be as for Level 2 construction (see Clause 3.9.2) except that no fibre-reinforced cement or aluminium sheet shall be used.

3.10 EAVES

3.10.1 Level 1 construction

All eaves in a Level 1 construction shall be enclosed, and the fascia or the gaps between the rafters shall be sealed (see Clause 3.9.1.1).

3.10.2 Level 2 construction

The requirements for eaves in a Level 2 construction shall be as for Level 1 construction (see Clause 3.10.1), except that all timber eaves lining and joining strips shall be of fire-retardant-treated timber.

A1 | ### 3.10.3 Level 3 construction

The requirements for eaves in a Level 3 construction shall be as for Level 2 construction (see Clause 3.10.2) except that aluminium shall not be used.

3.11 FASCIAS

3.11.1 Level 1 construction

There are no requirements for fascias in a Level 1 construction.

3.11.2 Level 2 construction

All materials used for fascias in a Level 2 construction shall be either non-combustible or of fire-retardant-treated timber.

A1 | ### 3.11.3 Level 3 construction

The requirements for fascias in a Level 3 construction shall be as for Level 2 construction (see Clause 3.11.2) except that no fibre-reinforced cement or aluminium sheet shall be used.

3.12 GUTTERS AND DOWNPIPES

3.12.1 Level 1 construction

Any materials or devices used to stop leaves collecting in the gutters of a Level 1 construction shall have a flammability index of not greater than 5 when tested in accordance with AS 1530.2.

3.12.2 Level 2 construction

The requirements for gutters and downpipes in a Level 2 construction shall be as for Level 1 construction (see Clause 3.14.1).

A1 | ### 3.12.3 Level 3 construction

The requirements for gutters and downpipes in a Level 3 construction shall be as for Level 2 construction (see Clause 3.12.2).

C3.12 An alternative approach would be to build without gutters and downpipes.

3.13 VERANDAS AND DECKS

3.13.1 Level 1 construction

Verandas, decks, and the like, forming part of a building required to be Level 1 construction shall comply with one, or a combination, of the following:

(a) *Slab* A reinforced concrete suspended slab floor, supported by posts or columns complying with Clause 3.4 or walls complying with Clause 3.5, or a slab-on-the-ground floor complying with Clause 3.3.

(b) *Sheeted or tongued and grooved solid flooring* The requirements for flooring are as follows:

(i) Compliance with the flooring requirements shall be in accordance with Clause 3.3.

(ii) Where the clearance between the finished ground level and the underside of the floor is not greater than 400 mm above finished ground level, all joints in the flooring shall be covered (above the floor level) or shall be sealed.

(c) *Spaced decking* The requirements for spaced decking are as follows:

(i) The decking timbers shall be fixed with a clearance of not less than 5 mm between adjacent timbers.

(ii) The external perimeter beneath the decking shall not be enclosed nor shall access to the space beneath the decking be impeded.

NOTE: This requirement is designed to ensure that access to extinguish fires and remove burning material is maintained.

(iii) Any supports for the decking shall be treated as set out in Clause 3.4.

(iv) Decking timbers shall not be allowed to connect with the remainder of the building unless measures are used to prevent the spread of fire into the building.

C3.13.1 The dangers represented by timber decks is significantly different to other parts of the building such as roofs due to the timber species, method of fixing, elevation and conditions of exposure. For these reasons, timber decking is not excluded.

The required spacing, for spaced decking, of at least 5 mm between deck timbers is nominal and was selected to allow water to be sprayed up from underneath the deck and reach both the deck surface and adjacent walls. This is facilitated by the external perimeter ground/floor gap not being sealed.

These requirements apply to low level verandas and decks even though access for firefighting purposes may be more restricted.

3.13.2 Level 2 construction

The requirements for verandas and decks in a Level 2 construction shall be as for Level 1 construction (see Clause 3.11.1) except that if spaced decking is used, fire-retardant-treated timber shall be used for the decking material.

A1

3.13.3 Level 3 construction

The requirements for verandas and decks in a Level 3 construction shall be as for Level 2 construction (see Clause 3.13.2) except that all materials shall be non-combustible or where timber is used, it shall be fire-retardant-treated (including any balustrades).

3.14 SERVICE PIPES (WATER AND GAS)

3.14.1 Level 1 construction

All exposed piping, for water and gas supplies, in a Level 1 construction shall be metal. Pipes of other materials shall be buried to a depth of at least 300 mm below the finished ground level.

3.14.2 Level 2 construction

The requirements for service pipes in a Level 2 construction shall be as for Level 1 construction (see Clause 3.12.1).

A1

3.14.3 Level 3 construction

The requirements for service pipes in a Level 3 construction shall be as for Level 2 construction (see Clause 3.14.2).

Arborist's Report
100 Wakehurst Parkway, Narrabeen North

April 2007

Commissioned by Jason Bennett

Prepared by Susan Hobley
B.Sc. (Environmental & Urban Horticulture)
MISA, MNAAA, MLGTRA, MPLA, MAIH, MASSSI, MEIA

biodesign
&associates pty. ltd.
75 Mullens St, Balmain NSW 2041 p: (02) 9810 5530 f: (02) 9810 5599 admin@biodesign.com.au www.biodesign.com.au

Executive Summary

The site (100 Wakehurst Parkway, Narrabeen North) is very long and relatively narrow. The site slopes down to Wakehurst Parkway and Is opposite Narrabeen Lagoon. The rear adjoins very steep terrain that supports remnant indigenous vegetation.

It is proposed to sub-divide the site to form two lots with a residential dwelling on each of them. Prior to the development of the building envelope for the proposed new lot, the applicant and his architect met on-site with a consulting arborist and an ecologist to identify trees that should be retained, a suitable building footprint and what would be the most suitable construction methods. Nine (9) trees were identified as worthy of retention. The architect then developed a proposed site lay-out and building design that has responded to the input from the arborist and will enable the retention of all the trees identified as being significant in terms of their ecological, environmental and amenity values.

Only seven (7) trees need to be removed to accommodate the development and none of them is significant. However, it is recommended that another four (4) be removed on the grounds that they will be problems in relation to the development if it is approved. Additionally, a very large base of an old, effectively dead tree is proposed for removal. The site and its boundaries contain eleven (11) trees that are listed as undesirable in Pittwater should be removed as part of any development. Many of the other trees on the site are not worth retaining, and the removal of eight (8) of them is recommended to enable better plantings to be established. The applicant proposes to remove all the listed undesirable species, all the trees within and very close to the building footprint, and an additional four trees that are very poor condition.

Where tree removals are approved, it is considered that replacement plantings should be on the basis of the different characteristics of the two new lots. The rear lot should be managed in accordance with the recommendations of any ecological sustainability plan or bushland management plan. Screening issues may arise and these should be addressed in such a plan. The front lot contains an overplanted, degraded landscape that needs to be re-designed and upgraded. The landscape plan should ensure that tree plantings are provided for that ensure the built form is secondary to the landscape and that screen plantings provide for privacy. The site has the potential to carry two or three large indigenous trees at the streetscape but other tree plantings should be in keeping with the residential nature of the site.

Trees to be retained will need to be protected in accordance with standard general protection measures or in relation to specific impacts they are liable to be exposed to.

Table of Contents

1. Introduction

This report is part of the second stage of the tree assessment and documentation process for the development application for 100 Wakehurst Parkway, Narrabeen North.

The first stage of the process involved consultations with the project architect, the owners of the property and a consulting ecologist to identify an acceptable building envelope based on the aim to preserve the site's tree assets.

This report was commissioned by Jason Bennet on behalf of the development proposal that was prepared after this initial process. The brief for the report was that the following issues be specifically addressed:

- The impacts on trees from the proposed development are to be identified and recommendations for tree management developed. All trees subject to Pittwater Council's Tree Preservation Order should be included in the assessment. Recommendations for the retention, removal or transplanting of trees are to be made and should include recommendations for any replacement plantings as necessary.
- A specification for the protection of the trees to be retained is to be developed to ensure trees to be retained are suitably protected during works.

The report includes assessments of the trees within five metres of the proposed development footprint or liable to adverse impacts associated with construction activities.

The purpose of the report is to:

1. Document the current condition of the trees in the vicinity of the proposed works.
2. Make recommendations in relation to the management of trees.
3. Provide specifications for the protection of trees during works.

2. Methods

The assessment and recommendations process occurred in two stages:

1. Preliminary assessment of tree assets to determine a suitable development footprint that minimised impacts on trees and was based on the retention of as many significant trees as possible.
2. Assessment of trees on the site and review of the development plans to identify likely impacts on existing trees and how they can best be managed.

Stage 1.

A preliminary site meeting with the applicants, architect and ecologist was held on 12th December 2006 to identify a suitable building envelope that takes into account tree assets and ecological values.

The basis on which trees were identified as being valuable and worthy of retention on the site, took into account the following factors:

- Risk management (structural condition and stability of trees taking into account current safety issues and potential problems that would arise if the development were to go ahead)
- Ecological values (provenance, food, perching and habitat resources, and the ecological context of the site)
- Environmental values (taking into account tree size and contributions to site environment and also including the health of the tree)
- Amenity values (taking into account shading, screening, contributions to a sense of place and diversity of spaces on the site, and human scale)
- Weed problems (including whether the species is listed as noxious or undesirable but also whether it is known to be weedy in similar environments in Sydney)
- Aesthetic values (including appearance, condition and form)

Stage 2.

The Site Plan (Dwg No. 003) prepared by Mike Foran Architecture dated 12.2.07 was reviewed to determine whether it reflected the preliminary recommendations in relation to trees. It is confirmed that this is the case and that the footprint does not require the removal of any trees identified as being valuable and worthy of retention on the site.

Pittwater Council's Tree Preservation Order (1997) was referred to in order to identify the trees on the site that are protected under the NSW Environmental Planning & Assessment Act (1979).

Site visits and assessments of the trees were conducted on February 16th and 26th, 2007.

Assessment of the trees was based on Visual Tree Assessment (VTA) and similar tree assessment guidelines (Mattheck, 1999 and Matheny and Clark, 1999 & 2004).

The inspections and assessments were conducted from ground level only. No aerial or subterranean inspections were undertaken.

Tree height was estimated. Trunk diameter was measured at 1200mm above ground level with a steel tape measure. Canopy spread was measured by pacing out where possible and estimated elsewhere.

During the site visit with the architectural Site Plan (Dwg No. 003) dated 12.02.07) prepared by Mike Foran Architecture was referred to during the assessments for details of the proposed footprints in relation to trees.

The recommendations of the Bushfire Risk Assessment Report prepared by Ron Coffey dated 11th March 2007 was reviewed to identify any impacts on trees in relation to the requirements of the Rural Fires Act.

The findings and recommendations were submitted to the client and the client's architect for finalisation of proposed tree removals under the development application.

3. Site Overview

The site consists of a deep residential property that faces Narrabeen Lagoon at the street frontage and adjoins bushland in the rear. The site is effectively divided into two separate sections as a result of its topography.

The lower portion, towards Narrabeen Lagoon has been cleared and graded to create a sloping but fairly even site with terraced garden beds in places. It contains a two-storey dwelling, a driveway access and a small garage. This section has been landscaped with grass and a mixture of exotic, native and indigenous species, including dense screen plantings in places.

The rear of the site is characterised by uneven rocky ground and steep topography that includes the base of a sheer sandstone cliff and large sandstone boulders that have broken away from the cliff's rock formation. This section contains mostly remnant indigenous vegetation but includes some plantings of native, not locally indigenous trees and contains weeds. It appears that some of the non-local trees may be self-sown from unknown stock.

4. Tree Assessments

Refer to site plan for locations and numbering of trees.

In all, fifty three (53) trees were assessed (including a group of eight that were counted as one tree). On the basis of the criteria outlined under Stage 1 methods, only nine (9) trees are considered to be worthy of retention or transplanting (see table 1). Twenty (20) trees are in a condition that justifies their removal if it is desired, although their retention is not likely to result in any serious problems in the near future. Thirteen (13) trees are in a condition that warrants their removal, particularly if further development occurs. Eleven (11) trees are listed as undesirable on Pittwater's TPO and their removal would be a requirement of any development approval. However, not all the trees assessed are on the site and the neighbours would need to be consulted if trees on boundaries or adjoining properties are proposed for removal.

Refer to table 2 for the tree assessment information.

Refer to Site Plan prepared by Mike Foran Architecture for proposed tree removals.

Table 1: Significance of trees located on 100 Wakehurst Parkway, based on consideration of the following factors: risk management; ecological, environmental, amenity, and aesthetic values; and weed issues.

Tree numbers	Number of trees	Significance
1, 3, 9, 10, 13, 21,22, 22C, 30	9	Worthy of retention
2, 4, 6, 7, 11, 12,14, 22A, 22B, 23, 28, 41, 42, 44, 45, 46, 47, 48, 49, 50	20	Remove if desired
5, 8, 15, 16, 27, 31, 32, 34, 35, 36, 37, 38, 43	13	Removal recommended
17, 18, 19, 20, 24, 25, 26, 29, 33, 39, 40	11	Removal required under TPO

5. The Development Proposal and Impacts on Trees

The proposal is to sub-divide the property into two lots, make alterations and additions to the existing dwelling, driveway, access and landscape in the front of the property and construct a new dwelling with garage, steps and inclinator. This will include:

- Demolition of some existing structures
- Realignment of the driveway.
- Excavations to construct access steps in the steep terrain leading to the new dwelling.
- Digging to provide pier footings for the new dwelling, decks and inclinator on the rear lot.

The proposed works will require the removal of seven (7) trees (nos. 7, 8, 15, 16, 31, 32 and 34).None of them is considered significant or worthy of retention. It is recommended that an additional four (4) trees (nos. 5, 6, 14 and 41) be removed on the grounds that they will be located in close proximity to future works and their condition warrants their removal to prevent future problems. Works within the rootzones of sixteen (16) other existing mature trees (nos. 10, 11, 12, 13, 27, 29, 30, 42, 43, 44, 45, 46, 47, 48, 49 and 50) will need to be managed so that adverse impacts do not occur and trees 21 and 22 will need to be protected from physical damage. It is considered that few of these trees are worth retaining (only trees 10, 13, 21, 22 and 30).

It is considered that it will be possible to retain, even if it is not necessarily desirable, all trees except the seven required for removal and the four recommended for removal to accommodate the proposed works.

6. Recommendations

It is recommended that trees 1, 3, 9, 10, 13, 21, 22, 22C and 30 be retained. It is recommended that trees 5, 6, 7, 8, 14, 15, 16, 31, 32 and 41 be removed to accommodate the development. It is recommended that trees 17, 18, 19, 20, 24, 25, 26, 29, 33, 39 and 40 be removed because they are listed as undesirable in Pittwater. In the case of trees 17 and 18 this will require permission from the neighbour. It is recommended that permission be given for the removal of any other trees provided suitable replacement plantings are specified. In the case of the rear lot, any replacements should be in accordance with the recommendations of an ecological sustainability plan (ESP) or bushland management plan (BMP). Screening for privacy may be required and the ESP or BMP should address this. In the case of the front lot, a landscape plan may need to be prepared to deal with issues of tree loss and privacy screening. It is considered that the front of the site can carry at least two and probably three large indigenous trees. Elsewhere on the site, smaller trees should be used to ensure that future management issues relating to their residential context do not arise.

7. Applicant's Response to Recommendations

After being provided with a draft report and the recommendations the applicant proposes to remove trees 5, 7, 8, 14, 15, 16, 17, 18, 19, 20, 24, 25, 26, 27, 29, 31, 32, 33, 34, 35, 36, 39, 40 and 41. This includes all the eleven listed undesirable species (trees 17, 18, 19, 20, 24, 25, 26, 33, 39 and 40) and fourteen additional trees (including the seven that are within the proposed building footprint and three that are within very close proximity of it).

8. Protection of Trees to Be Retained.

The trees to be retained fall into two categories with regard to the types of protection needed to ensure they are not adversely affected by the proposed works.

1. General protection – ensure trees are protected within fenced off exclusions zones that are to be managed to ensure no building impacts affect them.
2. Specific protection – manage trees in relation to the specific impacts they are liable to due to their vicinity to the works.

Trees 1, 2, 3, 4, 9, 22A, 22B and 22C should be protected in accordance with the General Protection measures outlined in the Appendix.

Trees 10, 11, 12 and 13 require a combination of protection measures. Because they are located within the area where access to the rear is required, they will need to be protected from the impacts of such access, including soil compaction or disturbance and physical damage to their above ground parts. They should be protected within exclusion fencing and managed in accordance with the general protection measures during this period. When the steps and inclinator are constructed, they will be exposed to additional disturbing and damaging impacts, in particular to damage to their root systems and potentially to physical damage to their aboveground parts. All works are to be conducted under the supervision of a qualified arborist. Only hand digging should occur within the significant rootzones of these trees. Without preliminary investigations, it is

not possible to identify where significant roots are located, so the final locations of holes for footings and cuts for steps should be determined on-site in consultation with the arborist. Final locations are to be determined on the basis of minimising damage to tree roots and avoiding the need to sever significant structural roots that affect any tree's stability.

Trees 21 and 22 need to be protected from physical damage during works. Site workers are to be inducted by a qualified arborist so that potential impacts such as physical damage to stems and branches from materials and equipment that are brought into the site are understood and will be avoided. Access will be beneath tree 21 so clearance of branches will be an issue that needs to be recognised by the workers.

Tree 23 (a group of 8 small trees) is located below the level of the existing driveway access. It should be protected behind exclusion fencing and a sediment control barrier should be installed to ensure that no run-off into the exclusion zone occurs.

Tree 28 will require protection behind an exclusion fence in accordance with the General Protection Measures outlined in the Appendix.

Tree 38 should be protected within an exclusion zone in accordance with General Protection Measures outlined in the Appendix.

The driveway design has been developed to provide a cut-out for tree 30. Additional measures will be required to ensure this tree is retained. They should be divided into two stages: construction works within five metres of the tree and other construction works. All construction works within the significant rootzone of the tree (an indicative setback is five metres but the arborist may modify this if excavations support it) are to be conducted by hand and supervised by the consulting arborist. No significant roots are to be severed.

Trees 42 to 50 need to be protected within exclusion fencing along the line of the proposed new driveway and managed in accordance with the General Protection Measures outlined in the Appendix. These specimens may require pruning to rectify previous inappropriate lopping. Due to their size and the existing driveway, it is unlikely that any significant roots will be encountered during excavation works. An arborist is to be consulted if any roots larger than 30mm need to be severed to accommodate the construction works.

Where tree removals occur within the vicinity of existing trees to be retained, all works are to be carried out in a manner that ensures adverse impacts compromising the trees to be retained do not occur.

Table 2: Summary of values and recommended management of trees at 100 Wakehurst Parkway, Narrabeen North.

Tree No.	Species (Common Name)	Provenance	Age	Dimensions	Condition	Current Hazard Rating	Proposed Treatment Recommendations	Comments
1	*Elaeocarpus reticulatus* (Blueberry Ash)	Remnant	Mature	Not measured due to access difficulties	**Vigour:** Good **Form:** Good **Structure:** Moderate	Low **Targets:** Infrequently used landscape area.	**Retain** Standard protection (not liable to impacts)	Co-dominant leaders from base. Healthy union. Poorly pruned. **Hazard potential:** Low **Preservation rating:** High
2	*Eucalyptus* sp. (Possibly piperita))	Remnant?	Juvenile	**Height:** 10 metres **Canopy:** 1 metre **DBH:** 80mm	**Vigour:** Poor **Form:** Poor **Structure:** Poor	Low **Targets:** Infrequently used landscape area	**Retain** Standard protection (not liable to impacts)	Forest form – very spindly with curving stem. **Hazard potential:** Low **Preservation rating:** Low
3	*Livistona australis* (Cabbage Tree Palm)	Remnant	Semi-mature	**Height:** 7 metres **Canopy:** 4 metres **DBH:** 300mm	**Vigour:** Good **Form:** Good **Structure:** Good	Low **Targets:** Infrequently used landscape area	**Retain** Standard protection	Growing amongst large boulders. **Hazard potential:** Low **Preservation rating:** High
4	*Eucalyptus piperita* (Sydney Peppermint Gum)	Remnant	Over-mature	**Height:** 10 metres **Canopy:** 5 metres **DBH:** 1000mm	**Vigour:** Good **Form:** Poor **Structure:** Poor	Low **Targets:** Infrequently used landscape area	**Retain** Standard protection (not liable to impacts) **Monitor for stability and Termites**	Old stump with remains of branch + 1 epicormic branch. Contains a termite nest. Vertical split down the middle. Top of remnant branch is dead with copious reaction wood on underside. **Hazard potential:** Medium **Preservation rating:** Low

Table 2: Summary of values and recommended management of trees at 100 Wakehurst Parkway, Narrabeen North.

Tree No.	Species (Common Name)	Provenance	Age	Dimensions	Condition	Current Hazard Rating	Proposed Treatment Recommendations	Comments
5	*Eucalyptus piperita* (Sydney Peppermint Gum)	Remnant	Juvenile	**Height:** 8 metres **Canopy:** **DBH:** 80mm	**Vigour:** Poor **Form:** Poor **Structure:** Poor	Low **Targets:** Infrequently used landscape area	**Remove**	Growing at a lean and curve in upper stem. All foliage is epicormic. **Hazard potential:** Medium **Preservation rating:** Low
6	*Eucalyptus sp.* (Unknown Gum)	Native	Mature	**Height:** 18 metres **Canopy:** 12 metres **DBH:** 380mm	**Vigour:** Moderate **Form:** Good **Structure:** Good	Low **Targets:** Unused landscape area	**Retain** Special Protection	Possibly planted or self-from planted specimen. Fairly thin canopy with minor dieback. **Hazard potential:** Low **Preservation rating:** Low
7	*Eucalyptus piperita* (Sydney Peppermint Gum)	Remnant	Juvenile	**Height:** 8 metres **Canopy:** 2 metres **DBH:** 130mm	**Vigour:** Moderate **Form:** Poor **Structure:** Poor	Low **Targets:** Infrequently used landscape area	**Remove**	Leaning and acutely curved upper stem. Covered in vine. **Hazard potential:** Medium **Preservation rating:** Low
8	*Eucalyptus piperita* (Sydney Peppermint Gum)	Remnant	Mature	**Height:** 17 metres **Canopy:** 16 metres **DBH:** 1000mm	**Vigour:** Good **Form:** Good **Structure:** Poor	Low **Targets:** Infrequently used landscape area	**Remove**	Large basal cavity with signs of termite activity. Co-dominant stems from 130mm with very acute union. Hangers, dieback in some major branches, epicormic growth. Appears stable. **Hazard potential:** High **Preservation rating:** Low

Table 2: Summary of values and recommended management of trees at 100 Wakehurst Parkway, Narrabeen North.

Tree No.	Species (Common Name)	Provenance	Age	Dimensions	Condition	Current Hazard Rating	Proposed Treatment Recommendations	Comments
9	Group of *Elaeocarpus reticulatus* (Blueberry Ash)	Remnant	Juvenile	**Height:** 6 metres **Canopy:** 4 metres (group) **DBH:** n/a	**Vigour:** Good **Form:** Moderate **Structure:** Good	Low **Targets:** Infrequently used landscape area	**Retain** Standard Protection (not liable to impacts)	Not significant but an ecological asset. **Hazard potential:** Low **Preservation rating:** High
10	*Synoum glandulosum* (Scentless Rosewood)	Remnant	Mature	**Height:** 5 metres **Canopy:** 2.5 metres **DBH:** 50mm 50mm	**Vigour:** Good **Form:** Moderate **Structure:** Moderate	Low **Targets:** Infrequently used landscape area	**Retain** Prune. Standard Protection	Twin-stemmed. Poorly pruned. Not significant but an ecological asset. **Hazard potential:** Low **Preservation rating:** High
11	*Eucalyptus microcorys* (Tallowwood)	Native	Mature	**Height:** 20 metres **Canopy:** 10 metres **DBH:** 400mm	**Vigour:** Good **Form:** Good **Structure:** Good	Low **Targets:** Infrequently used landscape area	**Retain** Standard Protection Remove rubble from base.	Minor dieback. Hangers from pruning and branch failures. Building rubble stock-piled at base (in adjoining property). Species liable to be weedy. Provides some screening. **Hazard potential:** Low **Preservation rating:** Medium
12	*Elaeocarpus reticulatus* (Blueberry Ash)	Remnant	Mature	**Height:** 10 metres **Canopy:** 2 metres **DBH:** 130mm	**Vigour:** Poor **Form:** Poor **Structure:** Poor	Low **Targets:** Infrequently used landscape area	**Retain** Standard Protection	Leggy, forest form with canpy only at top. Dieback and branch failure. Kink in stem. **Hazard potential:** Low **Preservation rating:** Low

Table 2: Summary of values and recommended management of trees at 100 Wakehurst Parkway, Narrabeen North.

Tree No.	Species (Common Name)	Provenance	Age	Dimensions	Condition	Current Hazard Rating	Proposed Treatment Recommendations	Comments
13	*Synoum glandulosum* (Scentless Rosewood)	Remnant	Mature	**Height:** 10 metres **Canopy:** 8 metres **DBH:** 350mm	**Vigour:** Good **Form:** Good **Structure:** Moderate	Low **Targets:** Infrequently used landscape area	**Retain** Special protection	Significant specimen. Triple branching at 1st union with swelling at base of one of the branches. Sheltered position. **Hazard potential:** Low **Preservation rating:** High
14	*Eucalyptus microcorys* (Tallowwood)	Native	Mature	**Height:** 18 metres **Canopy:** 4 metres **DBH:** 250 mm	**Vigour:** Moderate **Form:** Moderate **Structure:** Good	Low **Targets:** Garage; landscape area	**Remove**	Planted above rock outcrop. Forest form. Dieback of lower branches. Epicormics. **Hazard potential:** Medium **Preservation rating:** Low
15	*Eucalyptus microcorys* (Tallowwood)	Native	Mature	**Height:** 18 metres **Canopy:** 4 metres **DBH:** 260mm	**Vigour:** Good **Form:** Poor **Structure:** Poor	Low **Targets:** Garage; landscape area	**Remove** Should not be retained if development approved.	Planted above rock outcrop. Curve in stem. Pest attack damage to bark. Epicormics. **Hazard potential:** High **Preservation rating:** Low
16	*Eucalyptus botryoides* (Bangalay)	Indigenous (possibly remnant)	Mature	**Height:** 18 metres **Canopy:** 10 metres **DBH:** 400mm	**Vigour:** Moderate **Form:** Moderate **Structure:** Poor	Medium **Targets:** Garage; infrequently used landscape areas.	**Remove**	Probably planted with trees 14 and 15. Curve in main stem. Swelling of stem at approx. 3-4 metres. Unbalanced crown. Epicormic branches. Tree in questionable health. Borers and bark damage **Hazard potential:** High **Preservation rating:** Low

Table 2: Summary of values and recommended management of trees at 100 Wakehurst Parkway, Narrabeen North.

Tree No.	Species (Common Name)	Provenance	Age	Dimensions	Condition	Current Hazard Rating	Proposed Treatment Recommendations	Comments
17 - 20	*Syagrus romanzoffianum* (Cocos Palm)	Exotic	Mature				**Remove** **Removal required under TPO.**	Exempt from TPO. Note that tree 17 is in adjoining property and tree 18 is on boundary. The owner's permission is required for the removals.
21	*Ficus rubiginosa* (Port Jackson Fig)	Remnant	Mature (Young)	**Height:** 5 metres **Canopy:** 3 metres **DBH:** 200mm	**Vigour:** Good **Form:** Good **Structure:** Poor	Medium **Targets:** Neighbour's shed; landscape areas	**Retain** Special protection. **Monitor regularly for stability.**	Growing on boulder and leaning due to competition from tree 22. Roots have grafted with tree 22's. Tree appears stable but due to its location and lean it may become less stable as it ages. Provides good screening and amenity. **Hazard potential:** High **Preservation rating:** High
22	*Ficus rubiginosa* (Port Jackson Fig)	Remnant	Mature (Young)	**Height:** 8 metres **Canopy:** 12 metres **DBH:** Various to 300mm	**Vigour:** Good **Form:** Poor **Structure:** Moderate	Medium **Targets:** Garage and roofed area.	**Retain** Standard protection **Monitor regularly for stability.**	Growing on large boulder. Poorly pruned. Roots severed on southern rockface. Roots grafted with tree 21's. Provides excellent screening and amenity. **Hazard potential:** High **Preservation rating:** High
22A	*Eucalyptus sp.* (Unknown Gum)	Native	Semi-mature	**Height:** 10 metres **Canopy:** 10 metres **DBH:** 250mm 200mm 200mm	**Vigour:** Good **Form:** Moderate **Structure:** Moderate	Low **Targets:** Infrequently used landscape.	**Retain** Standard protection (not liable to impacts)	Self-sown. Situated at base of large rock that will protect it from development. Three-stemmed from base. All stems leaning and curved. **Hazard potential:** Low **Preservation rating:** Low

Table 2: Summary of values and recommended management of trees at 100 Wakehurst Parkway, Narrabeen North.

Tree No.	Species (Common Name)	Provenance	Age	Dimensions	Condition	Current Hazard Rating	Proposed Treatment Recommendations	Comments
22B	*Eucalyptus sp.* (Unknown Gum)	Native	Semi-mature	**Height:** 12 metres **Canopy:** 8 metres **DBH:** 280mm 150mm	**Vigour:** Moderate **Form:** Moderate **Structure:** Moderate	Low **Targets:** Infrequently used landscape.	**Retain** Standard protection (not liable to impacts)	Self-sown from planted parent. Situated at base of large rock that will protect it from development. Both stems leaning and one is curved. Smaller stem has a swollen, damaged lump that will fail. Minor bark damage on larger stem **Hazard potential:** Low **Preservation rating:** Low.
22C	*Livistona australis* (Cabbage Tree Palm)	Remnant	Semi-mature	**Height:** 6 metres **Canopy:** 6 metres **DBH:** 350mm	**Vigour:** Good **Form:** Good **Structure:** Good	Low **Targets:** Infrequently used landscape.	**Retain** Standard protection (not liable to impacts)	Situated at base of large rock that will protect it from development. **Hazard potential:** Low **Preservation rating:** High
23	8 x *Acmena smithii* (Lilly Pilly)	Indigenous	Semi-mature	**Height:** 8 metres **Canopy:** 1 metres **DBH:** up to 150mm	**Vigour:** Moderate **Form:** Poor **Structure:** Poor	Low **Targets:** Landscape and driveway.	**Retain** Special protection **Prune.**	In adjoining property. Screen planting that has been poorly pruned to allow access to garage. Low amenity. **Hazard potential:** Low **Preservation rating:** Low
24-26	*Syagrus romanzoffianum* (Cocos Palm)	Exotic	Mature				**Remove** **Removal required under TPO.**	Exempt from TPO.

Table 2: Summary of values and recommended management of trees at 100 Wakehurst Parkway, Narrabeen North.

Tree No.	Species (Common Name)	Provenance	Age	Dimensions	Condition and SULE	Current Hazard Rating	Proposed Treatment (Recommended)	Comments
27	*Jacaranda mimosifolia* (Jacaranda)	Exotic	Mature	**Height:** 18 metres **Canopy:** 16 metres **DBH:** 570mm 350mm	**Vigour:** Good **Form:** Good **Structure:** Poor to Moderate	Medium **Targets:** House, driveway, landscape.	**Remove**	Co-dominant leaders, one with a severe lean. Epicormics and dieback (typical of species). Poorly pruned. Ants' nest in soil at base. May require pruning of some roots to accommodate new driveway footprint. **Hazard potential:** High **Preservation rating:** Medium
28	*Archontophoenix cunninghamiana* (Bangalow Palm)	Native	Mature	**Height:** 10m and 8m **Canopy:** 3m and 3m **DBH:** 250mm 220mm	**Vigour:** Good **Form:** Good **Structure:** Moderate to good	Low **Targets:** House, landscape.	**Retain** Standard protection **Monitor for stability.**	Twin-stemmed from base (not usual in the species). **Hazard potential:** Medium **Preservation rating:** Medium
29	*Lagunaria patersonii* (Norfolk Is. Hibiscus)	Native	Mature				**Remove** **Removal required under TPO.**	Exempt from TPO.
30	*Ceratopetalum gummiferum* (NSW Xmas Bush)	Indigenous (may be a remnant)	Mature	**Height:** 12 metres **Canopy:** 5 metres **DBH:** 210mm 330mm	**Vigour:** Good **Form:** Moderate **Structure:** Moderate	Low **Targets:** Driveway and landscape	**Retain** Special protection **Monitor**	Fine old specimen. Forest form. Dieback in lower branches. Co-dominant leaders. Swelling below inclusion at 1st branch union in major stem and other swollen inclusions. Appears stable. **Hazard potential:** Low/Medium **Preservation rating:** High

Table 2: Summary of values and recommended management of trees at 100 Wakehurst Parkway, Narrabeen North.

Tree No.	Species (Common Name)	Provenance	Age	Dimensions	Condition and SULE	Current Hazard Rating	Proposed Treatment (Recommended)	Comments
31-32	*Syzygium sp. (prob. S. paniculatum)* (Lilly Pilly)	Indigenous or native	Mature (Young)	**Height:** 10 metres **Canopy:** 4-5 metres **DBH:** Up to 220mm	**Vigour:** Moderate to good **Form:** Poor **Structure:** Poor to Moderate	Low **Targets:** Garden	**Remove.**	Trees 31, 32 and 34 to 38 have been planted closely together in a line across the front of the site. They all have a forest form and have been poorly pruned. Many contain structural problems that will eventually become risk management problems but that is a long time off. The plantings have not performed well due to being too close together and they detract from the landscape amenity. **Hazard potential:** Low **Preservation rating:** Low
33	*Schefflera actinophylla* (Umbrella Tree)	Native	Mature				**Remove** **Removal required under TPO.**	Exempt from TPO.
34 to 38	*Syzygium sp. (prob. S. paniculatum)* (Lilly Pilly)	Indigenous or native	Mature (Young)	**Height:** 10 metres **Canopy:** 4-5 metres **DBH:** Up to 220mm	**Vigour:** Poor to good **Form:** Poor **Structure:** Poor to Moderate	Low **Targets:** Garden	**Remove all except tree 38.** Standard Protection for tree 28.	These trees have been planted too closely together. They all have a forest form and have been poorly pruned. Many contain minor structural problems. The plantings have not performed well due to being too close together and they detract from the landscape amenity. **Hazard potential:** Low **Preservation rating:** Low

Table 2: Summary of values and recommended management of trees at 100 Wakehurst Parkway, Narrabeen North.

Tree No.	Species (Common Name)	Provenance	Age	Dimensions	Condition and SULE	Current Hazard Rating	Proposed Treatment (Recommended)	Comments
39	*Schefflera actinophylla* (Umbrella Tree)	Native	Mature				**Remove** **Removal required under TPO.**	Exempt from TPO.
40	*Harpephyllum caffrum* (Kaffir Plum)	Exotic	Mature				**Remove** **Removal required under TPO.**	Exempt from TPO.
41	*Eucalyptus botryoides* (Bangalay)	Remnant	Over-mature	**Height:** 20 metres **Canopy:** 5 metres **DBH:** 860mm	**Vigour:** Poor **Form:** Poor **Structure:** Poor	Low **Targets:** Garden	**Remove**	The tree is near electricity wires and all branches have been lopped but left with very long pegs. It contains epicormic growth at the top. It is covered in vines. This old remnant is at the end of its life. **Hazard potential:** Low **Preservation rating:** Low
42	*Acmena smithii* (Lilly Pilly)	Indigenous	Mature	**Height:** 15 metres **Canopy:** 8 metres **DBH:** 280mm	**Vigour:** Good **Form:** Moderate **Structure:** Moderate	Low **Targets:** Landscape and driveway.	**Retain** Special protection	Planted. Unbalanced crown. Inclusion in major branch. Swellings in some unions. Very large exposed root. Damage to roots on driveway. Appears stable. **Hazard potential:** Low **Preservation rating:** Medium

Table 2: Summary of values and recommended management of trees at 100 Wakehurst Parkway, Narrabeen North.

Tree No.	Species (Common Name)	Provenance	Age	Dimensions	Condition and SULE	Current Hazard Rating	Proposed Treatment (Recommended)	Comments
43	*Koelreuteria paniculatum* (Golden Rain Tree)	Exotic	Mature	**Height:** 6 metres **Canopy:** 6 metres **DBH:** 120mm 220mm	**Vigour:** Good **Form:** Poor **Structure:** Poor	Low **Targets:** Landscape and driveway.	**Retain** Special protection	In neighbour's property. Very poorly pruned. Multi-stemmed. Interacting with roots of tree 42. **Hazard potential:** Low **Preservation rating:** Low
44 to 49	*Acmena smithii* (Lilly Pilly)	Indigenous	Mature	**Height:** 12 metres **Canopy:** 6 metres **DBH:** various	**Vigour:** Good **Form:** Poor **Structure:** Moderate	Low **Targets:** Landscape and driveway.	**Retain** Special protection	Planted along boundary. **Hazard potential:** Low **Preservation rating:** Low
50	*Syzygium paniculatum* (Lilly Pilly)	Indigenous	Mature	**Height:** 12 metres **Canopy:** 6 metres **DBH:** 220mm	**Vigour:** Good **Form:** Poor **Structure:** Poor	Low **Targets:** Overhead wires. Nature strip. Driveway.	**Retain** Special protection **Remedial pruning required**	Planted as part of screening along boundary. Poorly pruned for overhead wires. **Hazard potential:** Low **Preservation rating:** Low

9. Statement

I am a qualified, practicing environmental arborist, horticulturist and landscape design and management consultant. I completed a Bachelor of Science degree in Environmental and Urban Horticulture at the University of Technology, Sydney in 1998. I have worked as a consulting arborist, horticulturist and landscape planner since 1997 and am a member of several relevant professional associations. I am recognised as an expert witness by the Land & Environment Court of NSW.

Susan Hobley

B.Sc. (Environmental and Urban Horticulture)

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2nd April 2007

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APPENDIX 1 : PROCEDURES FOR PROTECTING TREES, VEGETATION AND LANDSCAPE AREAS ON WORK SITES

Overview

In any construction or building project, the adjoining area which will subsequently be developed as a landscape/garden, is highly sensitive to the impacts of work associated with excavation and building.

Soils are liable to be contaminated, compacted and in other ways disturbed. This has serious consequences for any plants, which are planted in their environment.

The effects of construction and machinery on any vegetation that is to be retained (e.g. trees) is also very damaging. Tree roots extend out beyond their overhanging canopy and are particularly abundant close to the soil surface. Machinery can damage and destroy them, and pollution can poison them or deprive them of essential nutrients. Additionally, the above-ground parts of the trees (trunks, branches and foliage) can easily be damaged. The consequences can be dieback, disease, reduced vigour and health, or death. These problems may occur slowly in many cases, in keeping with the different time-scale of a tree's lifespan.

When protective vegetation is removed, the remaining plants can suffer from sunburn and wind damage. If this is a risk, protective shelters should be erected.

Prevention Measures

It is essential that machinery and materials be excluded from the landscape areas and that no raw or waste materials be dumped on them.

Effective barriers that can withstand the impacts of machinery and equipment should be erected. Coloured tapes are useless. These barriers need to be erected under the supervision of a qualified horticulturalist or arborist, who can identify the areas of tree root systems and ensure that sensitive installation measures are followed. Signs explaining the purpose of the barriers should be erected. Where activities close to tree stems are unavoidable, treeguards should be used to prevent mechanical damage to the bark or wood.

Storage and cleaning facilities need to be set up in areas where they will not impact on the landscape area. Run-off from construction work should be prevented from entering the area.

Workers on the site need to be given appropriate training and regulations developed which apply penalties to persons not complying with them.

Platforms should be erected over soil areas containing tree roots where access for people or vehicles is required. In the event of damage to vegetation or soils occurring, immediate remedial work should be undertaken.

Tree Protection Zones (TPZs)

Tree Protection Zones are areas set aside to ensure that trees are adequately protected during work activities. They should encompass as substantial an area extending outwards from the base of the tree's stem (trunk) in all directions as possible. TPZs include the area above the fencing that contains the aerial parts of the whole tree.

The extent of the area to be protected varies according to the species and size of any tree. As a general indication, it should reach out to the outer edge of the tree's canopy (although tree roots usually extend beyond this). Any large roots beyond this extent should also be considered for inclusion.

TPZs should be protected by barriers that are sturdy enough to withstand site activities (including vehicular movements) and prevent them from impinging on the zone. (Chain wire mesh 1800mm high attached to galvanised metal posts set in concrete is suitable.)

The area within the zone should be cleared of any rubbish or weeds. It should be covered with clean, aged mulch to a depth of not less than 90mm and not more than 100mm.

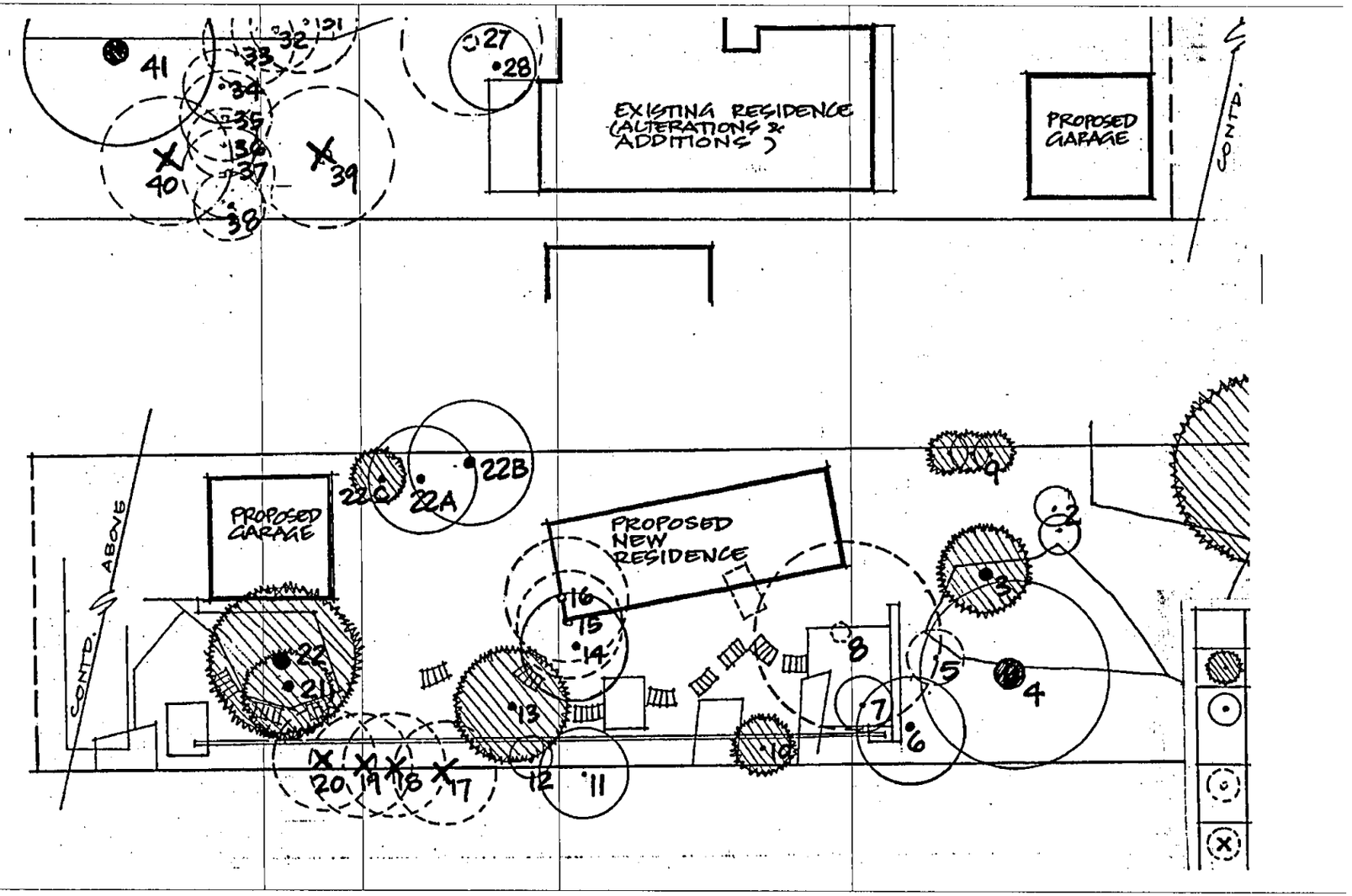
Erosion, run-off and sediment prevention measures (straw bails, supported geotextile, etc.) should include the TPZs.

Suitable signs that will withstand exposure to weather and site activities should be installed on the barriers. The signs should clearly state that the barriers surround a "no go" zone for the protection of the tree and that this zone is not to be breached by any unauthorized persons or by any site activities.

A water supply should be available to the TPZ.

TPZs should be monitored during the construction works to ensure they are being properly respected and maintained (weed and litter free; mulched).

After construction works are completed, the exclusion zones should be carefully removed. Mulch should be removed and replaced with clean, aged mulch to a depth of 70 to 75mm.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EXISTING RESIDENCE (ALTERATIONS & ADDITIONS)
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CONT'D.
PROPOSED GARAGE
22C
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PROPOSED NEW RESIDENCE
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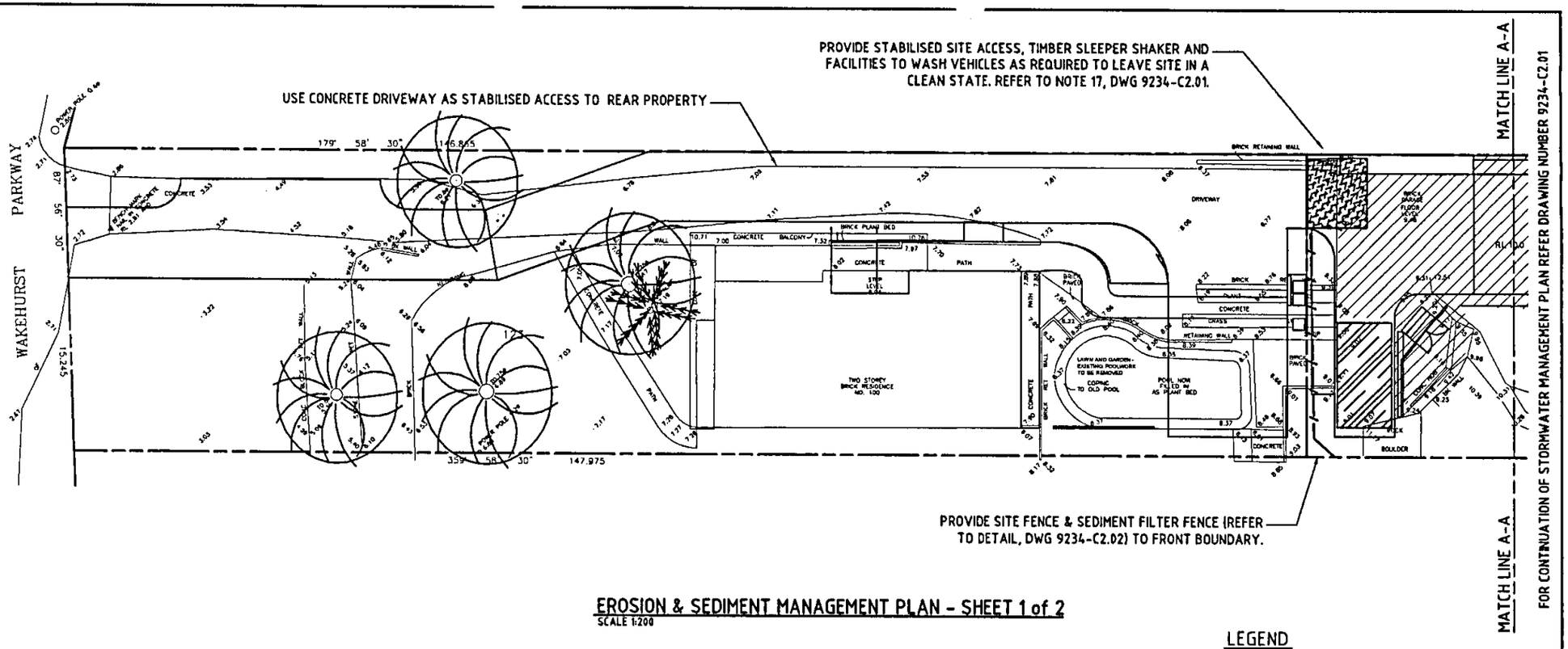
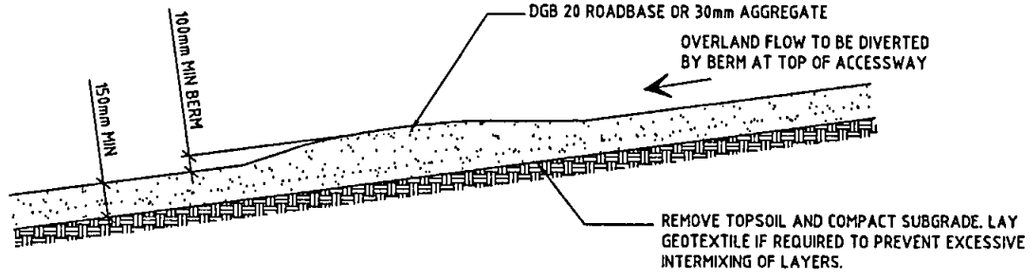


EROSION & SEDIMENT MANAGEMENT PLAN - SHEET 1 of 2

SCALE 1:200



STABILISED SITE ACCESS DETAILS

NOT TO SCALE

N

DIAL 1100 BEFORE YOU DIG

LEGEND

- × 69.63 — SURFACE LEVEL (mAHD)
- DENOTES AREA TO BE EXCAVATED. EXCESS EXCAVATED MATERIAL TO BE REMOVED FROM SITE.
- DIRECTION OF OVERLAND FLOW
- STOCKPILE AREAS
- SEDIMENT FILTER FENCE. REFER TO DETAIL.

NOTES

REFER TO DRAWING 9234-C2.01 FOR NOTES.

ISSUE	DESCRIPTION	BY	APR	DATE
A	ISSUED FOR CONSTRUCTION CERTIFICATE	JC	KW	06.07.10

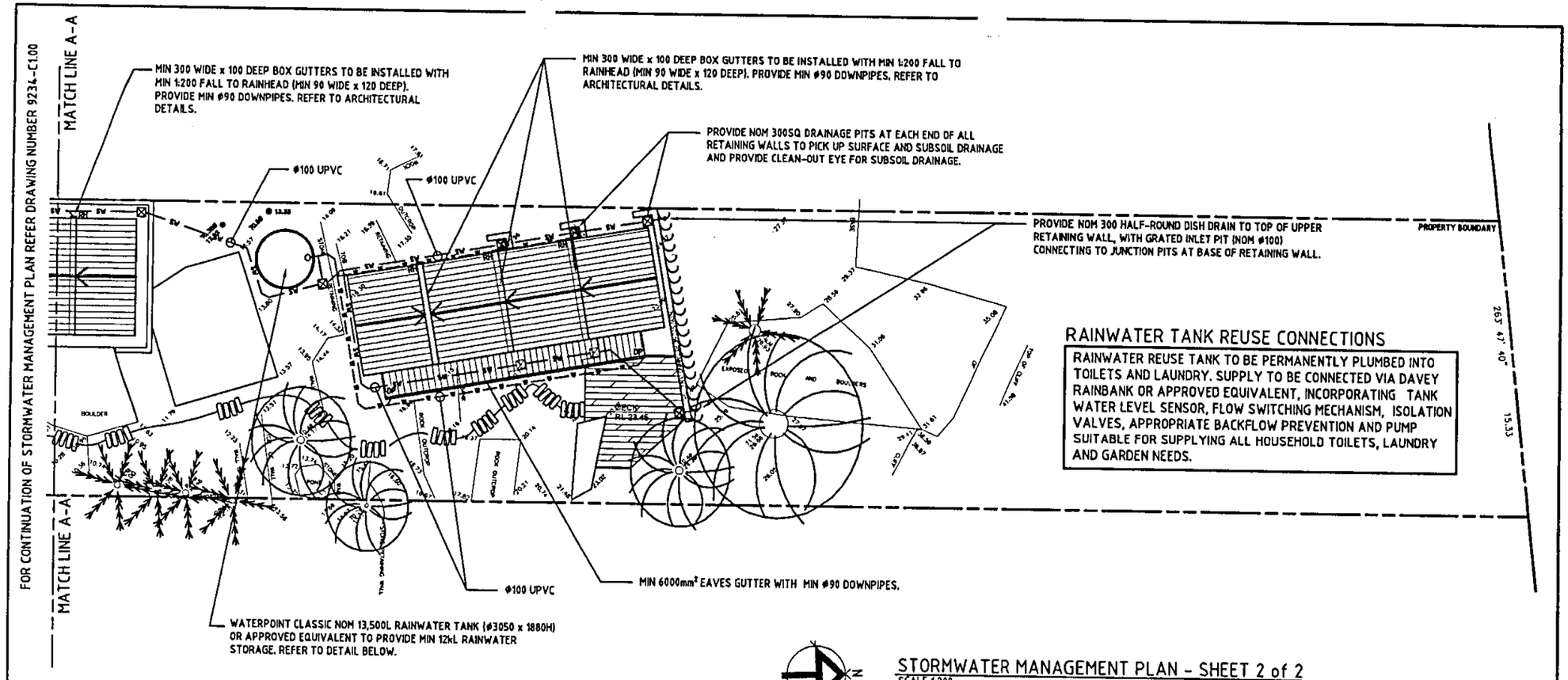
MF Architecture
PO Box 417,
MANLY NSW 1655
m: 0434 904 582
email: mforan@mfarchitecture.com.au

CHARTERED PROFESSIONAL ENGINEER:
Waddington Consulting Pty Ltd
ACN 130 822 661
Structural and Civil Engineering Consultants
Suite 6, Level 5, 22 Central Avenue Manly NSW
P.O. Box 1044 Manly NSW 1655
Phone (02) 9976 0070 Fax (02) 9976 0095
Email enquiries@wadconsulting.com

PROJECT:
PROPOSED NEW RESIDENCE
100A WAKEHURST PKWY, ELANORA HEIGHTS
for: BAUEN CONSTRUCTIONS

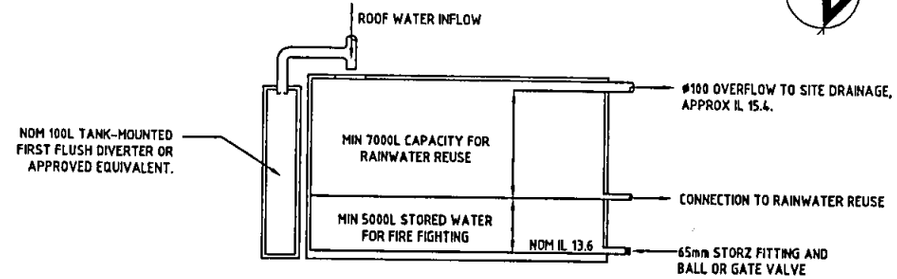
DRAWING TITLE:
EROSION & SEDIMENT MANAGEMENT PLAN - SHEET 1 of 2

DESIGN: K.W.	DATE: JULY 2010
DRAWN: K.W.	SCALE: 1:200
FILENAME: 9234-C1.00.DWG	
SIGNED: K Waddington	SIZE A3
DRAWING No: 9234-C2.00	REV A



STORMWATER MANAGEMENT PLAN - SHEET 2 of 2

SCALE 1:200



RAINWATER REUSE TANK DETAIL

SCALE 1:50

NOTES

REFER TO DWG 9234-C1.00 FOR NOTES.

LEGEND

- SW — NEW STORMWATER PIPE (SURFACE WATER AND TANK OVERFLOWS)
- W — NEW RAINWATER PIPE (ROOFWATER TO RAINWATER TANK)
- SW — EXISTING STORMWATER PIPE (APPROX)
- STORMWATER JUNCTION/INLET PIT
- EXISTING SURFACE RL (mAHD)
- TIMBER DECKING
- CONCRETE
- CONCRETE/GRASS PERMEABLE PAVING

ISSUE	DESCRIPTION	BY	APR	DATE
A	ISSUED FOR CONSTRUCTION CERTIFICATE	KW		06.07.10

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PO Box 417,
MANLY NSW 1655
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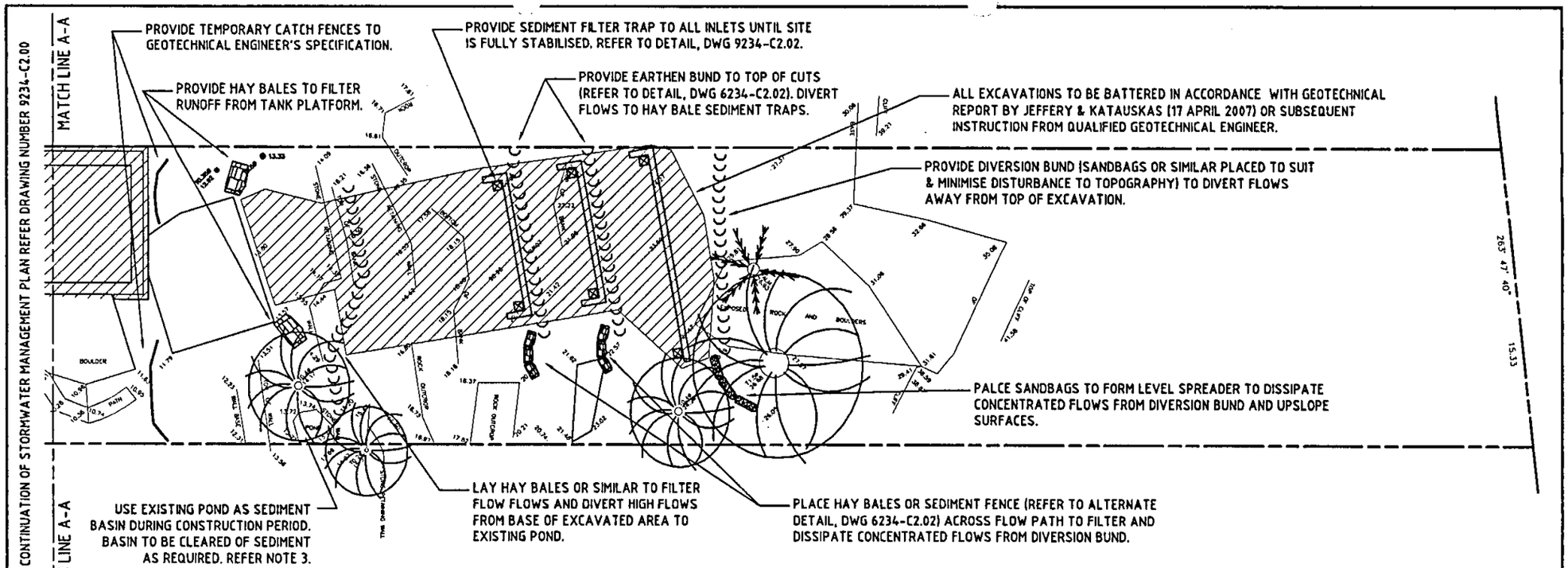
PROJECT:
PROPOSED NEW RESIDENCE
100A WAKEHURST PKWY, ELANORA HEIGHTS
for: BAUEN CONSTRUCTIONS

DRAWING TITLE:
STORMWATER MANAGEMENT PLAN - SHEET 2 of 2

DESIGN: K.W.	DATE: JULY 2010		
DRAWN: J.C.	SCALE: AS NOTED		
FILENAME: 9234-C1.01.DWG			
SIGNED:		SIZE	A3
DRAWING No: 9234-C1.01		REV	A



EROSION & SEDIMENT MANAGEMENT PLAN - SHEET 2 of 2

SCALE 1:200

NOTES

1. EROSION AND SEDIMENT CONTROL MEASURES, AS DESCRIBED IN THIS EROSION AND SEDIMENT CONTROL PLAN, MUST BE INSTALLED AND FUNCTIONAL PRIOR TO COMMENCEMENT OF SITE WORKS.
2. ALL EXISTING VEGETATION TO BE RETAINED AND OTHERS THAT NEED NOT BE DISTURBED SHOULD BE FENCED OFF FOR PROTECTION FROM CONSTRUCTION ACTIVITIES.
3. EROSION AND SEDIMENT CONTROL STRUCTURES ARE TO BE CLEARED OF ACCUMULATED SEDIMENT AND DETRITUS ON A REGULAR BASIS (MINIMUM ONCE A WEEK) AND AFTER ALL SIGNIFICANT RAINFALL EVENTS.
4. PROVIDE APPROPRIATE BINS FOR CONCRETE AND MORTAR SLURRIES, PAINTS, LIGHTWEIGHT WASTE AND LITTER. LIGHT-WEIGHT WASTE IS TO BE WIND-PROOFED. WASTE IS TO BE DISPOSED OF IN A TIMELY AND APPROVED MANNER.
5. WHERE A SMOOTH SURFACE IS NOT REQUIRED, DISTURBED AREAS SHOULD BE LEFT IN A ROUGHENED SURFACE CONDITION TO REDUCE RUNOFF VELOCITY AND INCREASE INFILTRATION.
6. TOPSOIL FROM EXCAVATION AREAS SHALL BE STRIPPED AND STOCKPILED FOR USE IN REHABILITATION OF DISTURBED AREAS AND/OR FUTURE LANDSCAPING.
7. LOOSE BUILDING MATERIALS (SAND ETC) TO BE STOCKPILED ON SITE AT DESIGNATED AREA. STOCKPILES TO BE COVERED OR OTHERWISE STABILISED TO REDUCE WIND AND WATER IMPACTS.
8. STOCKPILES OF LOOSE MATERIALS TO BE BATTERED AT 2V:1H AND NO MORE THAN 2 METRES IN HEIGHT UNLESS PROHIBITED BY INSUFFICIENT AREA.
9. REMOVE SPILT SAND AND OTHER MATERIALS FROM FLOW PATHS, GUTTERS, DRIVEWAYS AND PAVED AREAS AT THE END OF EACH DAY'S WORK.
10. DO NOT OPEN ANY TRENCH UNLESS IT IS LIKELY TO BE CLOSED WITHIN THREE DAYS. WHEN TRENCHING, PLACE EXCAVATED SOIL UPSLOPE OF THE TRENCH AND AWAY FROM AREAS OF CONCENTRATED RUNOFF.
11. WHEN CONSTRUCTING SEDIMENT FILTER FENCE, JOIN SECTIONS OF GEOTEXTILE AT SUPPORTS WITH A 150mm OVERLAP.
12. ALL DISTURBED AREAS ARE TO BE REHABILITATED AS SOON AS POSSIBLE. SITE MUST BE STABILISED PRIOR TO REMOVAL OF EROSION AND SEDIMENT CONTROL MEASURES.
13. CONSTRUCT SMALL EARTHERN BUND UPSLOPE OF ALL EXCAVATIONS AND STOCKPILES OF LOOSE MATERIALS TO DIVERT SURFACE RUNOFF AWAY FROM BATTER SLOPES AND STOCKPILES.
14. ROOF GUTTERING IS TO BE CONNECTED TO THE DRAINAGE SYSTEM AS SOON AS POSSIBLE.
15. UNDERTAKE PRIMARY REVEGETATION BY TURFING OR COVERING SURFACE WITH MULCH TO REDUCE EROSION HAZARD. MULCH THICKNESS TO BE 20-40mm FOR AREAS TO BE SEEDED OR 75-100mm IN AREAS REQUIRING LONG-TERM MULCHING.
16. BUILDING PLATFORM MAY ALSO BE USED AS STOCKPILE AREA.
17. WHEELS & UNDER-CARRIAGE OF EXCAVATOR TO BE WASHED TO REMOVE LOOSE MATERIALS & CLAY PRIOR TO LEAVING SITE. IF REQUIRED, OTHER VEHICLES LEAVING SITE TO BE WASHED TO MAINTAIN PUBLIC ROADS IN A CLEAN CONDITION.
18. UNDERTAKE ANY ADDITIONAL EROSION AND/OR SEDIMENT CONTROL MEASURES NECESSARY TO COMPLY WITH THE PROTECTION OF THE ENVIRONMENT OPERATIONS ACT (1997).

DIAL 1100 BEFORE YOU DIG

LEGEND

- × 69.63 — SURFACE LEVEL (mAHD)
- DENOTES AREA TO BE EXCAVATED. EXCESS EXCAVATED MATERIAL TO BE REMOVED FROM SITE.
- DENOTES AREA TO BE FILLED
- DIRECTION OF OVERLAND FLOW
- STOCKPILE AREAS
- SEDIMENT FILTER FENCE. REFER TO DETAIL.

ISSUE	DESCRIPTION	BY	APR	DATE
A	ISSUED FOR CONSTRUCTION CERTIFICATE	JC	KW	06.07.10

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PROJECT: PROPOSED NEW RESIDENCE
100A WAKEHURST PKWY, ELANORA HEIGHTS
for: BAUEN CONSTRUCTIONS

DRAWING TITLE: EROSION & SEDIMENT MANAGEMENT PLAN - SHEET 2 of 2

DESIGN: S.W.	DATE: JULY 2010
DRAWN: J.C.	SCALE: 1:200
FILENAME: 9234-C1.01.DWG	
SIGNED:	SIZE A3
DRAWING No: 9234-C2.01	REV A

SURVEY NOTE:
BOUNDARIES, LEVELS, CONTOURS, EXISTING IMPROVEMENTS AND TREES ARE DRAWN WITH REFERENCE TO SURVEY OF LOT 123 IN D.P. 13152 BY:
DP SURVEYING SERVICES,
DATED 14. AUGUST 2006

CONTOUR LINES HAVE BEEN ADDED POST SURVEY AND ARE AN APPROXIMATION ONLY.

CERTIFICATION
EROSION AND SEDIMENT MANAGEMENT PLAN PREPARED IN ACCORDANCE WITH NSW DEPT. OF LAND AND WATER CONSERVATION *- URBAN EROSION AND SEDIMENT CONTROL MANUAL*

LEGEND

SITE EXCLUSION FENCING
TYPICAL WIRE MESH FENCING TO 1800MM HEIGHT

SEDIMENT CONTROL FENCE / STRAW BALE FILTER

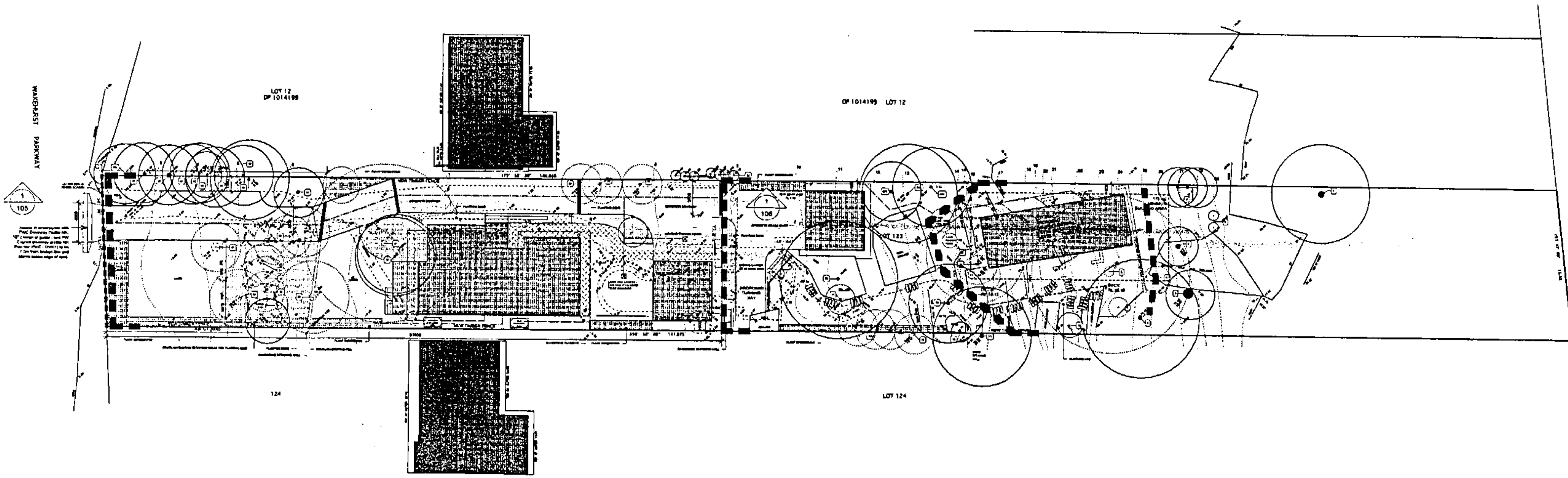
STABILIZED SITE ACCESS
STRIP TOPSOIL, COMPACT SUBGRADE, LAY 30-60MM CRUSHED CONCRETE AGGREGATE ON GEOTEXTILE FABRIC TO 200MM DEPTH

CONSTRUCTION NOTES - SEDIMENT CONTROL FENCE

1. CONSTRUCT SEDIMENT FENCE AS CLOSE AS POSSIBLE TO PARALLEL TO THE CONTOURS OF THE SITE.
2. DRIVE TIMBER OR STEEL PICKETS INTO GROUND, 3 M APART.
3. DIG A 150 MM DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
4. BACKFILL TRENCH OVER BASE OF FABRIC.
5. FIX SELF SUPPORTING GEOTEXTILE TO UPSIDE OF POSTS WITH WIRE TIES OR AS RECOMMENDED BY GEOTEXTILE MANUFACTURER.
6. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150 MM OVERLAP.

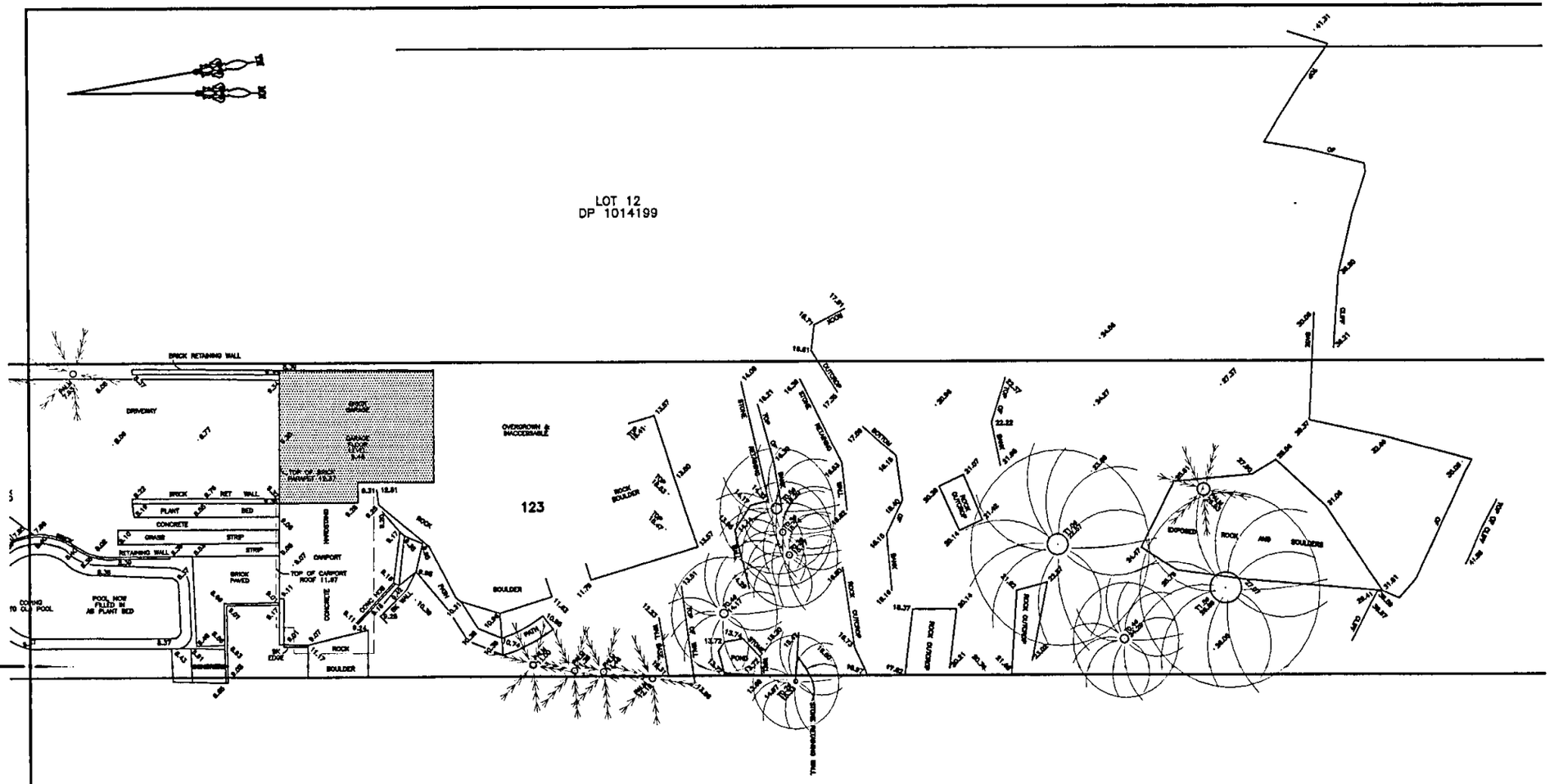
CONSTRUCTION NOTES - STRAW BALE FILTER

1. CONSTRUCT STRAW BALE FILTER AS CLOSE AS POSSIBLE TO PARALLEL TO THE CONTOURS OF THE SITE OR AT THE TOE OF THE SLOPE.
2. PLACE BALES LENGTHWISE IN A ROW WITH ENDS TIGHTLY ABUTTING. USE STRAW TO FILL ANY GAPS BETWEEN BALES. STRAWS TO BE PLACED PARALLEL TO GROUND.
3. ON SOFT MATERIALS, EMBED EACH BALE IN THE GROUND 75 MM TO 100 MM AND ANCHOR WITH 1.2 METER XXX PICKETS. ANGLE THE FIRST STAKE IN EACH BALE TOWARDS THE PREVIOUSLY LAID BAIL DRIVE STAKES 600 MM INTO THE GROUN AND FLUSH WITH THE TOP OF THE BALES.
4. WHERE A STRAW BALE FILTER IS CONSTRUCTED DOWNSLOPE FROM A DISTURBED BATTER THE BALES SHOULD BE LOCATED 1.5 M TO 2 M DOWNSLOPE FROM THE TOP OF THE BATTER.



mike foran architecture

SUBDIVISION OF LOT 123 IN D.P. 13152 FOR: MR. & MRS. BENNETT AT: 100 WAKEHURST PKWY, ELANOR HEIGHTS	EROSION & SEDIMENT MANAGEMENT PLAN	CONSTRUCTION	1:200	104
		13.04.2007		A1



NOTES:

1. CAUTION: SHOULD ANY DEVELOPMENT OR CONSTRUCTION BE PLANNED ON OR NEAR THE BOUNDARIES, THE BOUNDARIES SHOULD BE CLEARLY MARKED ON SITE.
2. SERVICES SHOWN HEREON HAVE BEEN DETERMINED FROM VISUAL EVIDENCE ONLY. PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON THE SITE THE RELEVANT AUTHORITY SHOULD BE CONTACTED TO ESTABLISH DETAILED LOCATION AND DEPTH. KONDUCT YOUR RISK AND DIAL 1100 BEFORE YOU DIG.
3. THE BEARINGS ON THESE PLAN BOUNDARIES ARE FROM LAND TITLES OFFICE PLANS AND ARE SUBJECT TO FINAL SURVEY. BEARINGS SHOWN ARE BASED ON A MAGNETIC MERIDIAN
4. V DENOTES WINDOW, D DENOTES DOOR. WINDOW AND DOOR DEPTHS SHOWN ARE INDICATIVE ONLY.
5. ALL NEW WORKS MUST REFER TO THE BENCHMARK FOR LEVEL CONTROL.
6. TREE SPREADS ARE DIAGRAMMATIC ONLY AND MAY NOT BE SYMMETRICAL.

PLAN OF

LOT 123 IN D.P. 13152

AT No.100 WAKEHURST PARKWAY, NARRABEEN

SCALE 1:100 DATUM A.H.D.

SITE AREA = 2246M SQ.

DP SURVEYING SERVICES

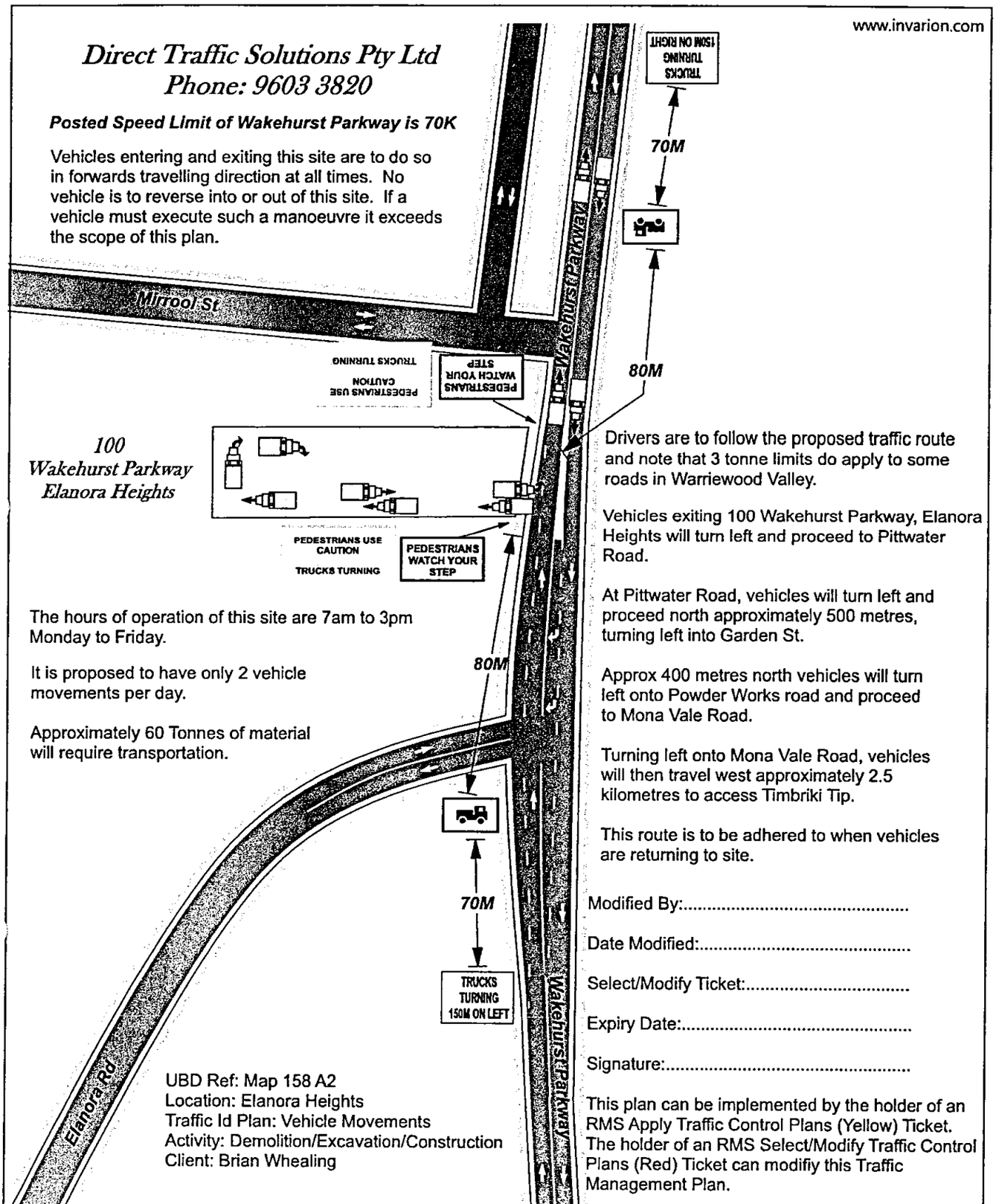
LAND & ENGINEERING SURVEYORS
SUITE 17/51 OLD BARRENJOEY RD, AVALON 2
PHONE : 99182068
FAX NO : 99187677
DATE : 14 AUGUST, 2006
MY REF : 1510

www.invarion.com

Direct Traffic Solutions Pty Ltd
Phone: 9603 3820

Posted Speed Limit of Wakehurst Parkway is 70K

Vehicles entering and exiting this site are to do so in forwards travelling direction at all times. No vehicle is to reverse into or out of this site. If a vehicle must execute such a manoeuvre it exceeds the scope of this plan.



The hours of operation of this site are 7am to 3pm Monday to Friday.

It is proposed to have only 2 vehicle movements per day.

Approximately 60 Tonnes of material will require transportation.

Drivers are to follow the proposed traffic route and note that 3 tonne limits do apply to some roads in Warriewood Valley.

Vehicles exiting 100 Wakehurst Parkway, Elanora Heights will turn left and proceed to Pittwater Road.

At Pittwater Road, vehicles will turn left and proceed north approximately 500 metres, turning left into Garden St.

Approx 400 metres north vehicles will turn left onto Powder Works road and proceed to Mona Vale Road.

Turning left onto Mona Vale Road, vehicles will then travel west approximately 2.5 kilometres to access Timbriki Tip.

This route is to be adhered to when vehicles are returning to site.

Modified By:.....

Date Modified:.....

Select/Modify Ticket:.....

Expiry Date:.....

Signature:.....

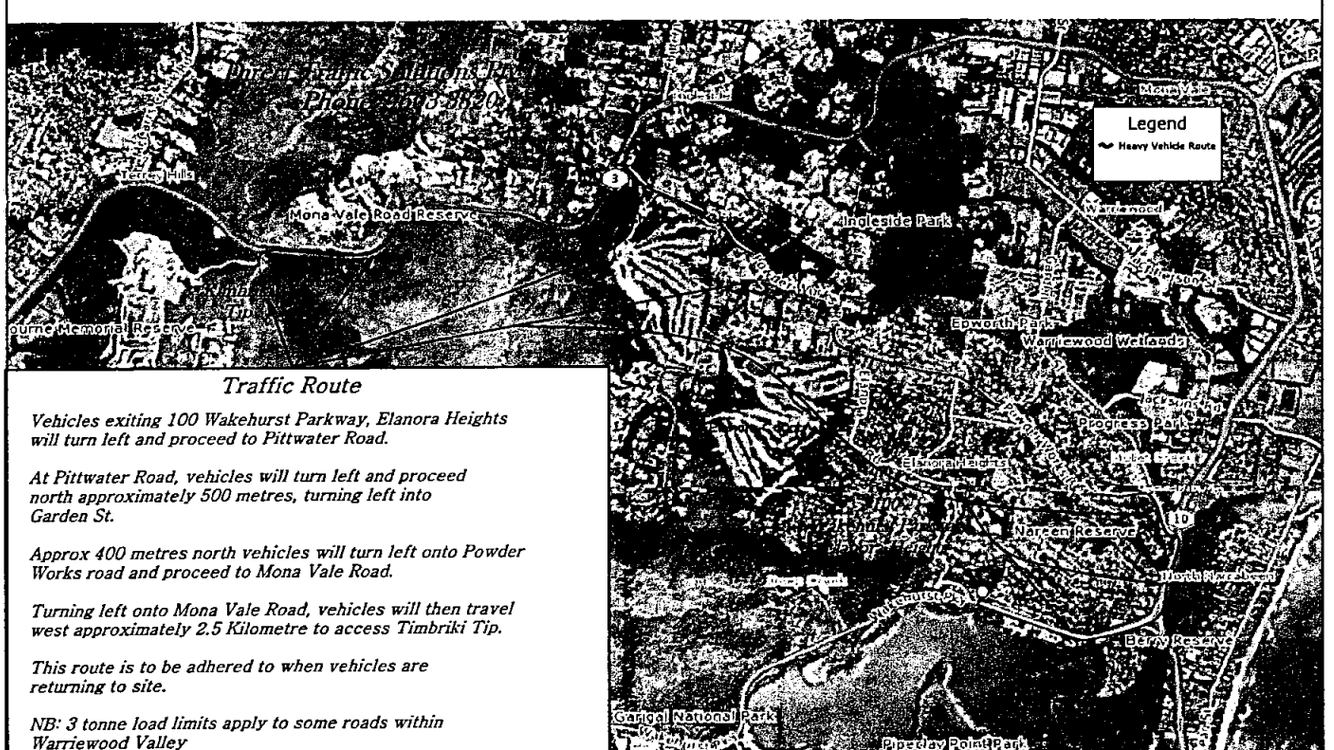
This plan can be implemented by the holder of an RMS Apply Traffic Control Plans (Yellow) Ticket. The holder of an RMS Select/Modify Traffic Control Plans (Red) Ticket can modifiy this Traffic Management Plan.

UBD Ref: Map 158 A2
Location: Elanora Heights
Traffic Id Plan: Vehicle Movements
Activity: Demolition/Excavation/Construction
Client: Brian Whealing

Date: 18/09/2012 **Author:** John Whitehead **Project:** 100 Wakehurst Parkway
Qualification: Design & Inspect TCP - 2163004203 **Expiry:** 05/11/2012 **Phone:** (02) 9603 3820
Fax: (02) 9603 3810 **Mobile:** 0416 357 610 **Key number Reference:** BW180912A

DIRECT TRAFFIC SOLUTIONS

Comments:



Traffic Route

Vehicles exiting 100 Wakehurst Parkway, Elanora Heights will turn left and proceed to Pittwater Road.

At Pittwater Road, vehicles will turn left and proceed north approximately 500 metres, turning left into Garden St.

Approx 400 metres north vehicles will turn left onto Powder Works road and proceed to Mona Vale Road.

Turning left onto Mona Vale Road, vehicles will then travel west approximately 2.5 Kilometre to access Timbriki Tip.

This route is to be adhered to when vehicles are returning to site.

NB: 3 tonne load limits apply to some roads within Warriewood Valley

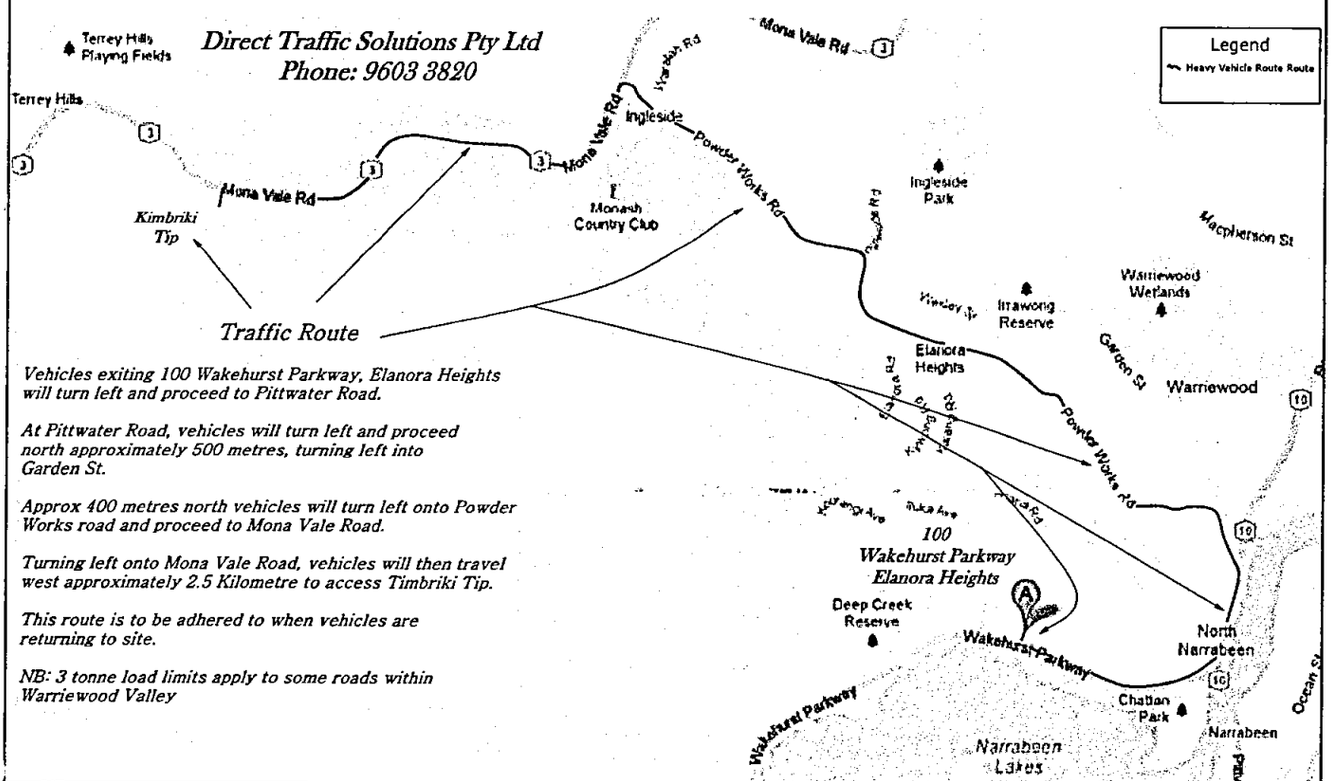
Date: 18/09/2012 **Author:** John Whitehead **Project:** 100 Wakehurst Parkway
Qualification: Design & Inspect TCP - 2163004203 **Expiry:** 05/11/2012 **Phone:** (02) 9603 3820
Fax: (02) 9603 3810 **Mobile:** 0416 357 610 **Key Number Reference:** VMPRoute

DIRECT TRAFFIC SOLUTIONS

Comments:

Direct Traffic Solutions Pty Ltd (DTS) accepts no liability for the implementation or execution of this TCP unless implemented by an Aurthorised DTS employee. This TCP is a copyright and remains the property of DTS and it is not transferable unless written permission is granted by DTS. This TCP has been generated to comply with AS:1742.3 2009 and the RMS TCWSM 2010 V.4
It is the clients responsibility to ensure that this TCP has been submitted to all relevant authorities and that all required permits have been obtained prior to commencement of works.

www.invarion.com



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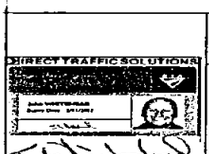


Date: 18/09/2012 **Author:** John Whitehead **Project:** 100 Wakehurst Parkway
Qualification: Design & Inspect TCP - 2163004203 **Expiry:** 05/11/2012 **Phone:** (02) 9603 3820
Fax: (02) 9603 3810 **Mobile:** 0416 357 610 **Key Number Reference:** VMPRoute2
Comments:

10. A site fence and silt and sediment control fence is to be erected and maintained during the course of works along any street boundary and park/reserve boundary to the site.

11. A clearly legible *Site Management Sign* is to be erected and maintained throughout the course of the works. The sign is to be centrally located on the main street frontage of the site and is to clearly state in legible lettering the following: -
    The builders name, builders telephone contact number both during work hours and after hours.
    That no works are to be carried out in Councils Road Reserve without the written approval of the Council.
    That a Road Opening Permit issued by Council must be obtained for any road openings or excavation within Councils Road Reserve associated with development of the site, including stormwater drainage, water, sewer, electricity, gas and communication connections. During the course of the road opening works the Road Opening Permit must be visibly displayed at the site.
    That no skip bins or materials are to be stored on Councils Road Reserve.
    That the contact number for Pittwater Council for permits is 9970 1111.

12. A satisfactory construction traffic management plan (CTMP) prepared by a suitably qualified traffic consultant is required to be submitted to the Private Certifying Authority prior to the commencement of any site works. The plan is to detail:
    - Quantity of material to be transported?
    - Proposed truck movements per day ? 2 x day
    - Proposed hours of operation ? 7 am –
    - Proposed traffic routes, noting that 3 tonne load limits apply to some roads within Warriewood Valley ✓

    This plan must be adhered to by all parties associated with the development. No truck movements will be permitted in Garden Street south of Mullet Creek or in Mona Vale Road between Tumbledown Dick and Mona Vale.

13. A stamped copy of the approved plans is to be kept on the site at all times, during construction.

14. Toilet facilities are to be provided in a location which will not detrimentally affect the amenity of any adjoining residents at or in the vicinity of the work site during the duration of the development.

JK Geotechnics
GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

PO Box 976, North Ryde BC NSW 1670
115 Wicks Rd, Macquarie Park NSW 2113
Tel: 02 9888 5000 Fax: 02 9888 5003
www.jkgeotechnics.com.au

6 December 2012
Ref No 20992ZRlet3

Mr Brian Whealing
39 Castle Circuit
SEAFORTH NSW 2092

Dear Sir

GEOTECHNICAL ADVICE AND REVIEW OF STRUCTURAL DRAWINGS
100 WAKEHURST PARKWAY, ELANORA HEIGHTS, NSW

At your request, we attended a meeting with you at the above site on 3 December 2012 at which Kyle Docherty was also present. The purpose of the site meeting was to inspect the sloping portion of the site with regard to the presence of potentially unstable features such as large detached boulders. As such, this inspection addressed the intent of Section 7.1.3 of our report (Ref.20992ZRrpt) dated 17 April 2007.

We note that previous driveway construction works have been undertaken around the former garage area which included stabilisation of the large detached block at the toe of the slope and stockpiling of sandstone boulders to the east of the large detached block. In this regard we also prepared a letter in relation to the subdivision application certificate (Ref. 20299ZRlet2rev1) dated 11 May 2012. The boulder stockpile and stabilisation of the large detached blocks have also addressed the intent of Sections 7.1.2 and 7.1.3 of our report (Ref. 20992ZRrpt) dated 17 April 2007.

The inspections completed on 3 December 2012 generally indicated that potentially unstable boulders and poor quality sandstone walls would be removed as part of the proposed works.

Above the north-eastern corner of the proposed house two detached sandstone boulders will require inspection at the start of the works to determine the scope and extent of stabilisation measures (see Plate 1). Test pits will need to be excavated at the base of the boulders to assess the need for underpinning and/or installation of rock bolts to permanently support the boulders. Any required stabilisation works will need to be carried out prior to works commencing.

GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER
FORM NO. 2 – PART B – To be submitted with detailed design for Construction Certificate

PART B Declaration made by Geotechnical Engineer or Engineering Geologist ~~and/or Coastal Engineer~~ (where applicable) in relation to the incorporation of the Geotechnical issues into the project design

I, PAUL ROBERTS on behalf of JK Geotechnics
(insert name) (trading or company name)

on this the 6/12/12
(date)

certify that I am a Geotechnical Engineer or Engineering Geologist ~~and/or Coastal Engineer~~ as defined by the Geotechnical Risk Management Policy for Pittwater - 2099 and I am authorised by the above organisation/company to issue this document and to certify that the organisation/company has a current professional indemnity policy of at least $2million. I also certify that I have reviewed the design plans and structural design plans for the Construction Certificate Stage and that I am satisfied that:

Please mark appropriate box

✓ the structural design meets the recommendations as set out in the Geotechnical Report or any revision thereto.

✓ the structural design has considered the requirements set out in the Geotechnical Report for Excavation and Landfill both for the excavation/construction phase and the final installation in accordance with Clause 3.2 (b)(iv) of the Geotechnical Risk Management Policy.

Geotechnical Report Details:

Report Title: GEOTECHNICAL ASSESSMENT AT 100 WAKEHURST PARKWAY, ELANORA HEIGHTS
Report Date: 17/4/07 AND LETTER (Ref. 20092ZLRletter) dated 6/12/12
Author: PAUL ROBERTS

Documentation which relates to or is relied upon in report preparation:

Structural drawings (Project No. 110104, Drawing Numbers S00, S01 & S02 Rev. 0) prepared by Docherty Consulting Engineers.

I am also aware that Pittwater Council relies on the processes covered by the Geotechnical Risk Management Policy, including this certification as the basis for ensuring that the geotechnical risk management aspects of the proposed development have been adequately addressed to achieve an "Acceptable Risk Management" level for the life of the structure taken as at least 100 years unless otherwise stated and justified.

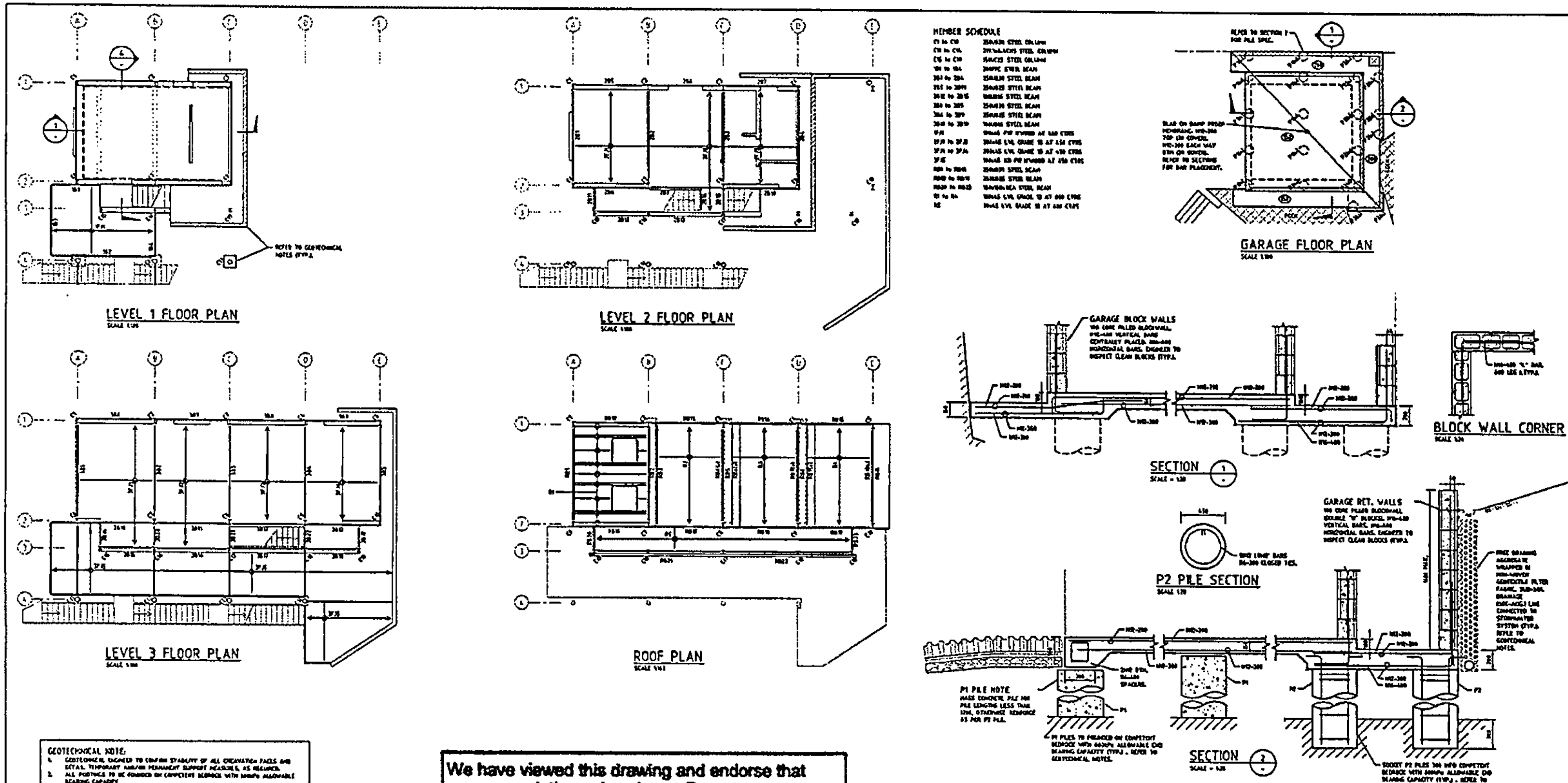
Signature ..... Paul Roberts .....

Name ..... PAUL ROBERTS .....

Chartered Professional Status ..... CP Eng .....

Membership No. ..... 2307698 .....

Company ..... JK Geotechnics .....



GEOTECHNICAL NOTE:

1. GEOTECHNICAL ENGINEER TO CONFIRM STABILITY OF ALL EXCAVATION FACES AND DETAIL TEMPORARY AND/OR PERMANENT SUPPORT MEASURES, AS REQUIRED.
2. ALL FOOTINGS TO BE FOUNDED ON COMPETENT BEDROCK WITH [illegible] ALLOWABLE BEARING CAPACITY.
3. GEOTECHNICAL ENGINEER TO VERIFY BEARING CAPACITY OF ALL FOUNDATIONS PRIOR TO CONCRETE PLACEMENT.
4. GEOTECHNICAL ENGINEER TO INSPECT ALL SUBSURFACE DRAINS PRIOR TO BACKFILLING.
5. ALL EARTHWORKS (e.g. ENGINEERED FILL etc) ARE TO BE IN ACCORDANCE WITH THE GEOTECHNICAL REPORT AND LETTER REFERRED TO IN NOTE 6.
6. THE STRUCTURAL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH GEOTECHNICAL REPORT REF. [illegible], DATED [illegible] APRIL 2007, AND LETTER [illegible], DATED 4 DECEMBER 2012, PREPARED BY JK GEOTECHNICS.

We have viewed this drawing and endorse that recommendations given in our Report No. 20992ZRpt (date) 17/4/07 have been adopted in principle, ~~except for modifications noted or underlined in red which should be adopted.~~

Signed: Paul [signature] Date: 6/12/12

For: Jeffery and Katauskas Pty Ltd, trading as JK Geotechnics
115 Wicks Road
Macquarie Park NSW 2113
Telephone: 02 9888 5000

Plan Certification	Docherty Consulting Engineers	Project	Drawn	Approved
I am a Structural Engineer holding the qualification of BE (Civil) and ME (Structural) and I am appropriately qualified to certify the structural components of this project. I hereby state that these plans and details comply with the conditions of development consent, the provisions of the Building Code of Australia and/or relevant Australian/Industry Standards. Kye Docherty BE ME PEng	DOCHERTY CONSULTING ENGINEERS, Structural & Civil. Docherty Consulting Engineers Pty Ltd ABN 74 105 101 540 ACN 105 101 540	NEW RESIDENCE At 100A WAKEHURST PARKWAY, ELANORA HEIGHTS For MR B. WHEALING	KRD	K R DOCHERTY
		Drawing Title: MARKING PLANS AND CONCRETE DETAILS	Date: 5.12.12	Purpose of Issue: CONSTRUCTION CERT.
			Scale: SHOWN	Sheet: A1 · Project: 110104 · Drawing: S01 · Rev: 0

GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER
FORM NO. 2 – PART A – To be submitted with detailed design for Construction Certificate

Development Application for Jason Bennett
Name of Applicant

Address of site _100 Wakehurst Parkway, Elanora Heights

PART A: Declaration made by Structural or Civil Engineer in relation to the incorporation of the Geotechnical issues into the project design

I, Kyle Docherty (insert name) on behalf of Docherty Consulting Engineers Pty Ltd (trading or company name)

on this the 6 December 2012 (date)

certify that I am a Structural or Civil Engineer as defined by the Geotechnical Risk Management Policy for Pittwater - 2009. I am authorised by the above organisation/company to issue this document and to certify that the organisation/company has a current professional indemnity policy of at least $2million. I also certify that I have prepared the below listed structural documents in accordance with the recommendations given in the Geotechnical Report for the above development and that

Please mark appropriate box

x the structural design meets the recommendations as set out in the Geotechnical Report or any revision thereto.

ə ~~the structural design has considered the requirements set out in the Geotechnical Report for Excavation and Landfill both for the excavation/construction phase and the final installation in accordance with Clause 3.2 (b)(iv) of the Geotechnical Risk Management Policy.~~

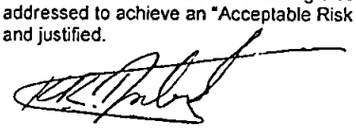
Geotechnical Report Details:

Report Title: Geotechnical Assessment of 100 Wakehurst Parkway, Elanora Heights Ref No. 20992ZRrpt, and Letter 20992ZRlet3. JK Geotechnics Report Date: 20992ZRrpt, dated 17/4/07, and Letter 20992ZRlet3, dated 6/12/12, Author: Paul Roberts Author's Company/Organisation: JK Geotechnics

Structural Documents list:

110104S00/rev0, 110104S01/rev0 and 110104S02/rev0

I am also aware that Pittwater Council relies on the processes covered by the Geotechnical Risk Management Policy, including this certification as the basis for ensuring that the geotechnical risk management aspects of the proposed development have been adequately addressed to achieve an "Acceptable Risk Management" level for the life of the structure taken as at least 100 years unless otherwise stated and justified.



K Docherty BE (Civil/Structural) ME (Structural)
Docherty Consulting Engineers Pty Ltd
77 Anzac Avenue, Collaroy NSW 2097

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
ABN 17 003 550 801

Email

AS/NZS ISO 9001 Certified
Davis Langdon Certification Services

To:	Brian Wheeling	Of:	-
Email:	brian0405@optusnet.com.au	Pages:	1 of 3
Ref No:	20992ZRsite report 3	Date:	29 April 2011
From:	Paul Roberts		
cc:			
Re:	GEOTECHNICAL ADVICE 100 WAKEHURST PARKWAY		

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SITE REPORT 3

INTRODUCTION

As requested the undersigned attended a site meeting with yourself and David Easterbrook on 29 April 2011. The purpose of the site meeting was to inspect the revealed subsurface conditions following clearance of selected areas of the proposed garage excavation and areas beneath Blocks A and B. This site report should be read in conjunction with our report (Ref. 20992ZRrpt) dated 17 April 2007 and our previous site reports (Ref. 20992ZRsite reports 1 and 2 dated 8 July 2010 and 19 April 2011, respectively).

Our geotechnical advice is provided below.

GEOTECHNICAL ADVICE

Garage Slab and Footings

Based on the clearance works it appears that the garage excavation will extend through sandy soils with numerous sandstone boulders. The subgrade for the garage footings (including the retaining wall footings lining the western side of the garage) and the floor slab will most likely comprise sandy soils. The garage subgrade and the base of the footing excavations should be prepared using a small vibratory roller and/or a hand held wacker packer, depending on access restrictions, in accordance with the advice provided in Section 7.1.9 of our report.

The compaction of the base of the footing excavations (and the allowable bearing pressure of the sandy soils) will need to be confirmed by Dynamic Cone Penetration

(DCP) testing by a geotechnical engineer. We understand that a structural detail drawing for the footings will be provided for our review prior to the DCP testing.

We warn that there may be localised areas of sandstone boulders over the subgrade areas of the footings and floor slabs and differential settlements may occur, at this stage we would estimate them to be no more than 10mm and would e expected to occur instantaneously (i.e. as construction proceeds. The structural engineer should confirm that this likely differential settlement is within acceptable serviceability limits. With regard to the floor slab, the potential for differential settlement of the slab at the interface between the sandstone boulders (and possibly bedrock) and soil subgrade areas should be controlled by additional construction joints and dowels. Further advice from the structural engineer should be sought.

Garage Excavation

Based on our observations we provide the following revised guidance with regard to treatment of Blocks A, B and C.

Block A: the clearance works over the eastern side of the block have revealed a 'jagged' base to the void beneath the block formed by sandstone boulders. The clearance of soil below the base of the remainder of the western and northern side of the block should be completed to reveal sandstone bedrock and/or the top surface of the boulders before infilling with concrete is to commence. Before any excavation works commence in the vicinity of this block the void will need to be infilled as described in our previous Site Report 1.

Block B: the test pit excavated at the toe of the southern side of the block indicated that the base of the block extended back to the north about 1.2m then stepped down at least 1.4m beneath adjacent surface levels. This side of the block does not require underpinning and may be backfilled and the proposed landscaping completed. However, over the western side of the block (which will be exposed as part of the garage excavation) we recommend that from subgrade level a test pit be carefully excavated at the toe of the block and inspected by a geotechnical engineer to assess whether or not underpinning of the block (using blade walls) will be required. The base of the block may need to be propped during the excavation and underpinning works.

Block C: we understand that if possible this block is to remain. We therefore recommend that the block be carefully trimmed and the stability of the block be monitored; no site personnel or equipment should be present adjacent to the eastern side of the block in as this area would be the 'fall zone' if instability occurs. If the block shows signs of significant movement during excavation works then we recommend it be removed. However, if little or no movement is discerned then the block may remain in place and further assessed by a geotechnical engineer to confirm whether or not the permanent stabilisation measures described in Site Report 2 are required.

Water Tank

A new water tank will be located behind Block A and the area has been cleared to reveal a sandy subgrade with occasional boulders. The subgrade should be excavated to the required level then the sandy subgrade prepared in a similar manner as described above for the garage floor slab. Confirmatory DCP testing of the subgrade by a geotechnical engineer will be required. Similar comments regarding control of potential differential movements between areas of sandstone boulder and sandy soil subgrade also applies here and the design of the concrete water tank base should be checked in this regard by the structural engineer. We understand that flexible pipework connections will be used and we concur with this approach as they will be better able to withstand the potentially detrimental impacts of differential movements.

Should you require further information please do not hesitate to contact the undersigned.

Regards
For and on behalf of
JEFFERY & KATAUSKAS PTY LTD

Paul Roberts
Senior Associate

NOTE: IF MESSAGE NOT CORRECTLY RECEIVED PLEASE TELEPHONE.

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
ABN 17 003 550 801

Email

AS/NZS ISO 9001 Certified
Davis Langdon Certification Services

To:	**Brian Whealing**	**Of:**	**-**
Email:	**brian0405@optusnet.com.au**	**Pages:**	**1 of 3 + Plate A**
Ref No:	**20992ZRsite report 2**	**Date:**	**19 April 2011**
From:	**Paul Roberts**		
cc:			

Re: **GEOTECHNICAL ADVICE**
100 WAKEHURST PARKWAY

☐ Urgent ☐ Please Reply ☐ Please Comment ☐ Quote ☐ Preliminary Report

SITE REPORT 2

INTRODUCTION

As requested the undersigned attended a site meeting with David Easterbrook on 18 April 2011. The purpose of the site meeting was to confirm the extent of the remaining driveway works, assess the amount of rock excavation and likely scope of stabilisation measures. The site report should be read in conjunction with our report (Ref. 20992ZRrpt) dated 17 April 2007 and our previous site report (Ref. 20992ZRsite report 1) dated 8 July 2010.

The comments provided below should be read in conjunction with the attached Plate A which provides a selection of site photographs.

The existing garage has been demolished and the majority of the driveway slab had been poured. The remaining works include:

- Construction of the 'grass paver' portions of the new driveway,
- Excavate a horizontal distance of about 8m back to the north into the hillside and a maximum vertical height of about 2.5m to 3m for the proposed garage at the northern end of the driveway, and
- Construct the two new garages at the northern and north-eastern ends of the driveway.

Our geotechnical advice is provided below.

SYDNEY OFFICE: PO BOX 976, NORTH RYDE BC NSW 1670
115 Wicks Road, Macquarie Park NSW 2113
Tel: 02 9888 5000 • Fax: 02 9888 5003
CENTRAL COAST OFFICE: 22 PERCY JOSEPH AVENUE, KARIONG NSW 2250
Mob: 0418 233 243 • Fax: 02 4340 0350
SOUTH-WESTERN SYDNEY OFFICE: PO BOX 528, MOOREBANK NSW 1875
Mob: 0414 610 690 • Fax: 02 9888 5014

GEOTECHNICAL ADVICE

Driveway

The remainder of the driveway construction should be completed in a similar manner as the previous portions of the new driveway.

We expect that the 'grass paver' areas will be relatively flexible. However, we note that the subgrade area over the north-eastern portion of the driveway will comprise bedrock (exposed at surface level) and sandy soils. There is the potential for differential settlement of the paved areas at the interface between the bedrock and soil subgrade areas. If this is of concern (particularly over any areas of concrete floor slab or driveway) then additional construction joints and dowels will be required. Further advice from the structural engineer should be sought.

Garage Excavation

The excavation for the garage at the northern end of the new driveway will extend through detached sandstone blocks and intact bedrock. There are some concerns with regard to the stability of selected large blocks during the excavation and are outlined below:

Block A: this corresponds to the large detached sandstone block to the north of the garage which was described in our previous Site Report 1. Before any rock excavation works commence, the voids below the base of this block will need to be infilled as described in our previous Site Report 1.

Block B: located over the north-eastern portion of the new garage. This block contains a full height open crack which lies close to the eastern margin of the excavation. The base of the block forms an overhang at least 0.5m high; the base comprises soil which is supported by the existing paved pathway. Before rock excavation commences this block will need to be supported by permanent blade wall underpins (at least 0.5m wide) which are founded on bedrock, extend the full height and depth of the overhang. We recommend that a test pit be excavated to confirm the depth to bedrock and the test pit inspected by a geotechnical engineer. The base of the block will need to be propped during the excavation and underpinning works.

Block C: located on the eastern side of the new garage, with the southern face of the block sloping down to the north-west. At least 60% of this block will be removed as part of the proposed excavation. The base of the block appears to be embedded in the ground and the rear (northern side) of the block supports two smaller blocks. This block may be entirely removed (together with the blocks behind) or the remaining portion left in place following completion of the garage excavation. If the remaining portion is to remain then to prevent toppling of the block, a permanent concrete or masonry buttress will need to be provided over the base of the block. The buttress will need to extend a vertical height equivalent to at least 50% of the total block height with the buttress founded on bedrock. Alternatively, the block may be permanently supported by two rock bolts likely to be at least 4m long.

The rock excavations will need to be completed with care so as to reduce the potential for de-stabilisation of the rock cut faces and/or detached blocks of sandstone. Rock saw and or rock grinder attachments to tracked excavators will be required.

If rock breakers are used then periodic quantitative vibration monitoring should be completed with rock saw cuts provided around the perimeter of the rock excavation prior to the use of rock breakers in order to limit the transmission of vibrations. The saw cut will need to be maintained below the level at which rock breakers will be used at all times. We assume that dilapidation surveys have been completed on the neighbouring properties to the east and west (Section 7.2.5 of our report). If not, then they will need to be completed before rock breakers are used in the rock excavation.

In accordance with Section 7.2.6 of our report, an excavation/retention methodology must be prepared and submitted to the geotechnical engineer for review and approval.

In addition to geotechnical inspection of the test pit beneath Block B, geotechnical inspection of the garage rock excavation faces will need to be completed at no more than 1.5m depth intervals to check for the presence of potentially unstable blocks or wedges of bedrock.

Excavation For New Dwelling

Over the footprint of the new dwelling; the upper western side of the slope and the central portion of the upper slope lining the toe of the cliffline further vegetation clearance is required. We recommend that following the vegetation clearance the footprint of the proposed dwelling be marked out n site then a geotechnical inspection be undertaken to confirm the scope and extent of stabilisation measures.

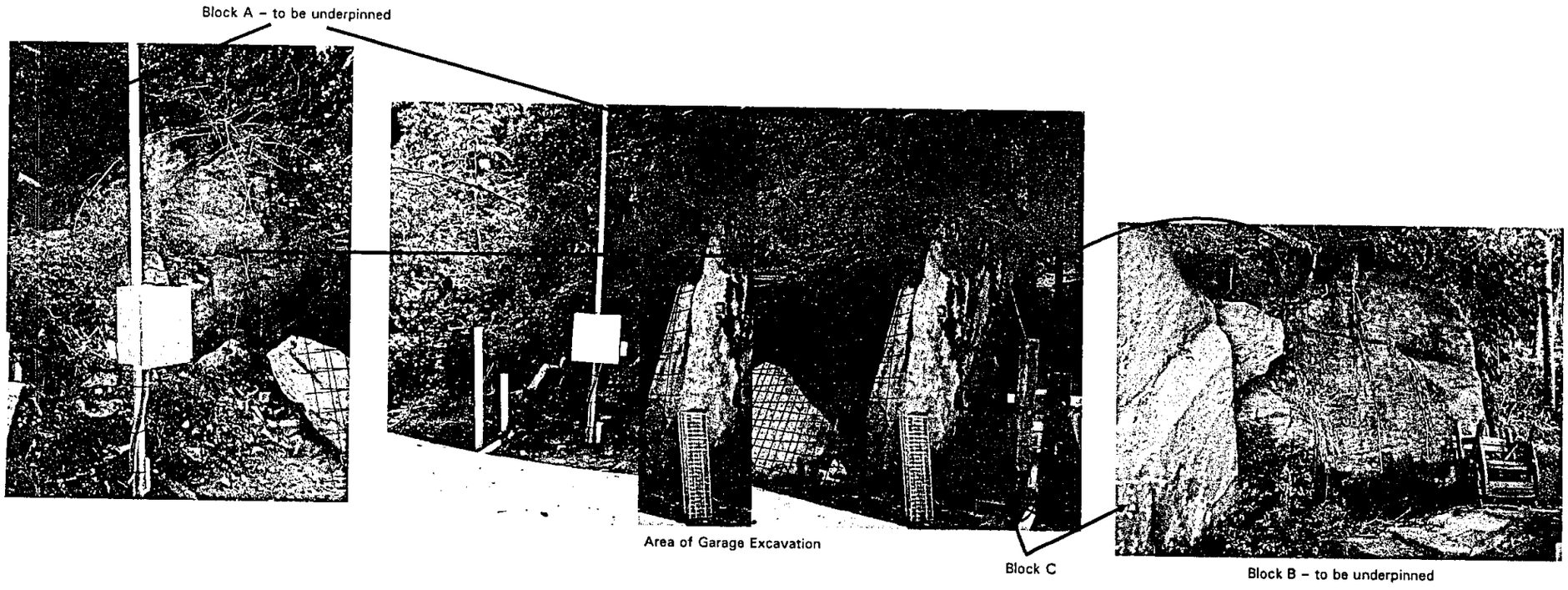
In relation to the scope and extent of stabilisation measures, as recommended in our previous Site Report 1 the site meeting should also be attended by the stabilisation contractor so that the scope and extent of the works can be confirmed and any site constraint issues which may affect the installation of the stabilisation measures identified.

Should you require further information please do not hesitate to contact the undersigned.

Regards
For and on behalf of
JEFFERY & KATAUSKAS PTY LTD

Paul Roberts
Senior Associate

NOTE: IF MESSAGE NOT CORRECTLY RECEIVED PLEASE TELEPHONE.



Selected Photographs of Proposed Garage

To be read in conjunction with Site Report 2.

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
ABN 17 003 550 801

Email

AS/NZS ISO 9001 Certified

To:	Brian Whealing	Of:	-
Email:	brianw@bauen.com.au	Pages:	1 of 2
Ref No:	20992ZRsite report 1	Date:	8 July 2010
From:	Paul Roberts		
cc:			
Re:	GEOTECHNICAL ADVICE 100 WAKEHURST PARKWAY		

☐ Urgent ☐ Please Reply ☐ Please Comment ☐ Quote ☐ Preliminary Report

SITE REPORT 1

At your request the undersigned attended a site meeting with you, the builder (David Easterbrook) and the structural engineer (Davood of MYD Engineers). The purpose of the site meeting was to assess the amount of current vegetation clearance, the likely scope of additional geotechnical site works and likely scope of stabilisation measures. The site report should be read in conjunction with our report (Ref. 20992ZRrpt) dated 17 April 2007 and the comments provided below and confirm our site discussions.

We understand that the existing garage will be demolished and a new garage constructed. Therefore the works outlined in Section 7.1.1 of our report will not be required. However, following demolition of the garage vegetation and loose debris should be cleared from the area behind the garage in order to allow further geotechnical assessment of the condition of any rock faces behind the garage and the base of the western side of the large detached sandstone block (to the north of the garage) and the area of stacked sandstone blocks to the east of the existing garage.

The base of the large detached sandstone block to the north of the garage appeared to bridge over a void with portions of the base supported on bedrock and the southern side of the base of the block forming an undercut. The loose debris over the southern and eastern side of the base of the block should be removed then the void below the base of the block and the undercut southern side supported by a mass concrete underpin. The final extent and details of the underpin will need to be confirmed by geotechnical inspection following the above described clearance works.

SYDNEY OFFICE: PO BOX 976, NORTH RYDE BC NSW 1670
115 Wicks Road, Macquarie Park NSW 2113
Tel: 02 9888 5000 • Fax: 02 9888 5003
CENTRAL COAST OFFICE: 22 PERCY JOSEPH AVENUE, KARIONG NSW 2250
Mob: 0418 233 243 • Fax: 02 4340 0350
SOUTH-WESTERN SYDNEY OFFICE: PO BOX 528, MOOREBANK NSW 1875
Mob: 0414 610 690 • Fax: 02 9888 5014

Based on our inspection of the current upper and mid portions of the slope we do not consider that the catch fence outlined in Section 7.1.2 of our report needs to be constructed. However, following completion of the stabilisation measures outlined below and once excavation has commenced, we recommend that an earthworks bund be provided adjacent to the eastern side of the large detached block.

At this stage, the vegetation clearance has revealed a number of potentially unstable blocks that will require permanent stabilisation using concrete underpins and sub-vertical hot dipped galvanised rock bolts socketted at least 1m into sandstone bedrock. The undersigned identified three areas requiring such measures with between 2 and 3 rock bolts required for each area. At this stage we note that the lengths of rock bolts is difficult to confirm as the depth to bedrock is not known; the drilling of the rock bolt holes will be the guide to this detail. As such, flexibility in terms of actual rock bolt lengths will need to be addressed by the stabilisation contractor.

Over the upper western side of the slope and the central portion of the upper slope lining the toe of the cliffline further vegetation clearance is required. At this stage the overgrown area of sandstone blocks lining the toe of the central portion of the cliffline is likely to require permanent stabilisation using proprietary rock netting supported by rock bolts. We recommend that following the additional vegetation clearance a further geotechnical inspection be undertaken.

In relation to the scope and extent of stabilisation measures, we recommend a joint site meeting with ourselves and the stabilisation contractor (Rix Group) in attendance so that the scope and extent of the works can be confirmed and any site constraint issues which may affect the installation of the stabilisation measures identified.

We also note that you will prepare a Safe Work Method Statement for the proposed works which we recommend be submitted to ourselves and MYD Engineers for review.

Should you require further information please do not hesitate to contact the undersigned.

Regards
For and on behalf of
JEFFERY & KATAUSKAS PTY LTD

Paul Roberts
Senior Associate

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Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
ABN 17 003 550 801

Proposal

AS/NZS ISO 9001 Certified

To:	Brian Whealing	C/-:	(Mike Foran) Mike Foran Architecture
Email:	mfarchitecture@gmail.com	Pages:	1 of 11
Ref No:	P20992ZRextra	Date:	28 January 2010
From:	Paul Roberts	cc:	

Re: GEOTECHNICAL ADVICE FOR CONSTRUCTION CERTIFICATE
100A WAKEHURST PARKWAY, ELANORA HEIGHTS, NSW

☐ Urgent ☐ Please Reply ☐ Please Comment ☐ Quote ☐ Preliminary Report

INTRODUCTION

Thank you for your enquiry. The requirements of your brief dated 18 January 2010 have been noted. Section 7.2 of our report outlines the conditions and additional work required for completion of detailed design and for the Construction Certificate. Section 7.3 of our report outlines the conditions and additional work required during the construction period.

SECTION 7.2

Based on the contents of our report, we consider that the following additional work is required for completion of detailed design and for the Construction Certificate in relation to the DA application for the rear portion of the site.

Paragraph 7.2.1

The additional geotechnical investigations and inspections referred to in paragraphs 7.1.1, 7.1.2 and 7.1.3, i.e.:

Paragraph 7.1.1

If the existing retaining wall located immediately below (to the south) of the proposed new residence is to remain, then assessment of the strength and stability of the wall by a structural and geotechnical engineer will be required. The assessment may include excavation of test pits to reveal existing footings.

Paragraph 7.1.2

Prior to site clearance and excavation, we recommend that a temporary catch fence be provided and located to the east and west of the large boulder located above the existing double garage. The catch fence is required to prevent detached blocks that

SYDNEY OFFICE: PO BOX 976, NORTH RYDE BC NSW 1670
115 Wicks Road, Macquarie Park NSW 2113
Tel: 02 9888 5000 • Fax: 02 9888 5003
CENTRAL COAST OFFICE: 22 PERCY JOSEPH AVENUE, KARIONG NSW 2250
Mob: 0418 233 243 • Fax: 02 4340 0350
SOUTH-WESTERN SYDNEY OFFICE: PO BOX 528, MOOREBANK NSW 1875
Mob: 0414 610 690 • Fax: 02 9888 5014

may fall from the slope above rolling downslope and impacting existing or proposed buildings and structures. The catch fence would need to be socketted into sandstone bedrock and its design may be completed following additional geotechnical investigations.

Paragraph 7.1.3
Access to the base and crest of the existing cliffline crossing the rear of the site was restricted. We recommend that before construction commences, access be provided to the crest of the cliff in order that a geotechnical engineer check for any potentially unstable blocks of sandstone. In addition, the base of the cliff should be cleared of vegetation and stockpiled materials to allow geotechnical inspection of any potentially unstable undercut features. If any stabilisation measures are required, such as rock bolts, removal of potentially unstable blocks and/or underpins they would be detailed following the geotechnical inspections. The stabilisation measures (if required) would need to be completed following construction of the catch fence (described in paragraph 7.1.2 above) and before the commencement of demolition and construction works.

Paragraph 7.2.2
All structural design drawings must be reviewed by the geotechnical engineer who should endorse that the recommendations contained in this report have been adopted in principle.

Paragraph 7.2.4
All hydraulic design drawings must be reviewed by the geotechnical engineer who should endorse that the recommendations contained in this report have been adopted in principle.

Paragraph 7.2.7
The proposed contractor must prepare an excavation/retention methodology as outlined in Paragraph 7.2.6 of our report. The excavation/retention methodology must be reviewed and approved by the geotechnical engineer.

SECTION 7.3
Based on the contents of our report, we consider that the following conditions requiring geotechnical input will need to be met during the construction period in order for us to complete Council Form 3.

Paragraph 7.3.1
Any localised stabilisation measures that may be required to the cliff face at the rear of the site must be witnessed by the geotechnical engineer.

Paragraph 7.3.2
The geotechnical engineer must inspect all footing excavations prior to placing reinforcement or pouring the concrete.

Paragraph 7.3.4
Bulk excavations must be progressively inspected by the geotechnical engineer as excavation proceeds.

Paragraph 7.3.5
Proposed material to be used for engineered fill and backfilling behind retaining walls must be approved by the geotechnical engineer prior to placement.

Paragraph 7.3.6
Density testing of engineered fill.

Paragraph 7.3.8
The geotechnical engineer must inspect all subsurface drains prior to backfilling.

Paragraph 7.3.10
Rock anchor proof-testing and lift-off tests must be witnessed by the geotechnical engineer.

Paragraph 7.3.11
The geotechnical engineer must confirm that the proposed development has been completed in accordance with the geotechnical reports. It is noted that this will require completion of the inspections outlined above. Should the inspections not be completed, then the geotechnical engineer may not be able to complete Form 3, which is required by Council prior to issue of the Occupation Certificate. In this regard we would also need to be provided with:

- Any engineered fill density test results (if not completed by ourselves).
- Where retained, the results of checks for leaks within existing stormwater system, sewer and water mains using static head and pressure tests under the direction of the hydraulic engineer or architect. If leaks are found, details of the repairs (Paragraph 7.3.7).
- An 'as-built' drawing of all buried services at the site must be prepared, including all pipe diameters, pipe depths, pipe types, inlet pits, inspection pits, etc (Paragraph 7.3.9).
- The anchor contractor must provide the geotechnical engineer with all field records including anchor installation and testing records (Paragraph 7.3.10).

SCOPE OF WORK

The scope of works outlined below has been subdivided in relation to the above Sections and Paragraphs of our report.

SECTION 7.2

Paragraph 7.2.1

We note that the majority of the proposed additional geotechnical site work requires clearance of vegetation and any stockpiled materials covering portions of the toe of the cliff line crossing the northern portion of the site. In this regard, we have assumed that we would arrange for site clearance works. There is a degree of uncertainty as to the extent of the proposed investigations until clearance works have been completed. We have therefore made an estimate of the time allowed to complete the clearance and investigations within the scope of works outlined below:

- An initial site meeting attended by the undersigned (Associate), a representative of the clearance contractor and the architect at which the various areas of the site requiring clearance can be identified. The architect would assist in confirming approximate building locations in order to effectively target areas requiring clearance. Assuming the site meeting would be a maximum of 1 hour duration, plus travel time and expenses, our cost estimate would be: $798.00 plus GST.

- Complete site vegetation clearance works to allow further inspections and subsurface investigations. On the basis that the works would be completed in one day, our cost estimate would be: $1,150.00 plus GST.

- Following the site clearance we would then attend site to complete the additional geotechnical investigations to provide information in relation to Paragraphs 7.1.1, 7.1.2 and 7.1.3. The fieldwork would be completed using hand held tools by a specialist geotechnical investigation sub-contractor under the direction of our geotechnical engineer. The fieldwork has been assumed to be completed over the course of two days and our cost estimate would be: $4,132.00 plus GST. The scope of works included in this cost estimate would be

  - Along the base of the cliffline excavation of four test pits to maximum 1.2m depth in order to determine the nature and extent of any potentially unstable detached sandstone blocks and/or undercut areas at the base of the cliffline.

  - Along the toe of the existing retaining wall, excavation of four test pits to maximum 1.2m depth in order to determine the nature and extent of existing footings. From the base of each test pit a borehole would be hand auger drilled to a depth of about 2m or prior refusal. These would be augmented by a Dynamic Cone Penetrometer (DCP) tests to maximum 4m depth or prior refusal to assist with assessment of strength and relative density. Two additional DCP tests would be completed behind the crest of the retaining wall to assess the nature of the strength/compaction of the retained materials. The refusal depth

of DCP tests can also provide an indicative depth to rock, though we note that refusal can also occur on obstructions in fill, 'floaters' and other hard layers.

- Along the length of the proposed catch fence hand auger drill two boreholes to a depth of about 2m or prior refusal. These would be augmented by five DCP tests to maximum 4m depth or prior refusal to assist with our estimation of depths to bedrock.

The results of the fieldwork would be used to prepare an additional geotechnical report including:

- Comments on the condition of the existing retaining wall and recommendations for wall strengthening and/or re-construction (Paragraph 7.1.1),

- Details of the likely scope and extent of stabilisation measures for discrete detached blocks, sections of outcrops and/or portions of the cliffline; sketch design details would also be provided (Paragraph 7.1.2), and

- Advice on the detailed design of the proposed catch fence (Paragraph 7.1.3).

The above reporting would be completed for a lump sum fee of: $2,100.00 plus GST.

Fieldwork: Assumptions/Additional Information and Charges
In relation to the above fieldwork, we have allowed to carry out a 'Dial Before You Dig' search. However, additional costs are involved if your site is affected by assets owned by RailCorp, Integral Energy and occasionally some other utilities, as these organisations require one of our staff members attend personally to collect and sign for the plans. Generally the additional cost for us to attend their office would be $200+GST.

We note that following our review of the services drawings, we may require that an electronic scan for buried services be carried out for OH&S of our staff and equipment, irrespective of your requirements. We will then inform you that we will be charging an additional $250 for the scan. This requirement is not optional as we cannot allow our staff and equipment to work under conditions which are deemed to be potentially hazardous.

As noted above, the refusal depth of DCP tests can also provide an indicative depth to rock, though we note that refusal can also occur on obstructions in fill, 'floaters' and other hard layers. To confirm that bedrock has been encountered and to determine rock quality, alternative investigation using wash bore and diamond coring techniques is required, but allowance for such drilling has not been included in this proposal.

If the site clearance works and/or subsurface investigations extend beyond the time allowed for then the additional work for Jeffery & Katauskas staff would be charged at the rates provided below. With regard to the clearance works and specialist geotechnical investigation contractor, additional work per person would be charged at

$500.00/day plus GST and hire of equipment (e.g. chainsaws) would be charged at $150/day.

Paragraph 7.2.2
Review and endorsement of all structural design drawings (including completion of Council Form 2) would be completed for a lump sum fee of $500 plus GST. However, this assumes that the structural drawings have, in principle, adopted the comments and recommendations provided in our previous report and the report prepared to comply with the requirements of paragraph 7.2.1 outlined above.

If substantial comments and/or amendments are required in relation to the provided structural drawings then the additional work would be charged at the rates outlined below.

Paragraph 7.2.4
Review and endorsement of all hydraulic design drawings would be completed for a lump sum fee of $300 plus GST. However, this assumes that the hydraulic drawings have, in principle, adopted the comments and recommendations provided in our previous report and the report prepared to comply with the requirements of paragraph 7.2.1 outlined above.

If substantial comments and/or amendments are required in relation to the provided structural drawings then the additional work would be charged at the rates outlined below.

Paragraph 7.2.7
The proposed contractor must prepare an excavation/retention methodology as outlined in Paragraph 7.2.6 of our report. The excavation/retention methodology must be reviewed and approved by the geotechnical engineer.

In our experience it may be beneficial for a site meeting to be held between the geotechnical engineer, contractor and any other interested parties prior to the contractor preparing the excavation/retention methodology. This would assist in clarifying the scope of works and the information to be provided in the excavation/retention methodology. Attendance at the site meeting by an Associate would be charged at $548.00 plus GST (assuming a meeting of 1 hour duration); additional meeting times would be charged at the rates provided below.

Review of excavation/retention methodology would be completed for a lump sum fee of $500 plus GST. However, this assumes that substantial comments and/or amendments are not required. Additional work to provide substantial amendments and/or liaison with the contractor would be charged at the rates outlined below.

SECTION 7.3

During construction, regular geotechnical inspections will be required to meet the requirements of Paragraphs 7.3.1, 7.3.2, 7.3.4, 7.3.5, 7.3.6, 7.3.8 and 7.3.10. For this aspect of the works it is difficult to be sure how much input will be required from us as it will depend on the ground conditions and the contractor's work methods, sequence and program. Consequently, we propose to carry out the work on a schedule of rates basis as follows:

For site visits, including travel time and cost, site attendance, for office review of documents provided, analysis, reporting, QA review, consultation, coordination or attendance at meetings would be at the following hourly rates:

Principal	$276/hour plus GST
Senior Associate	$250/hour plus GST
Associate	$220/hour plus GST
Senior Engineer	$176/hour plus GST
Geotechnical Engineer	$135/hour plus GST
Geotechnician	$80/hour plus GST
Vehicle costs	$36/site visit plus GST
Disbursements (e.g. photographs)	At cost plus 10%

Subject to the following minimum charge per site visit (up to 1 hour on site):

Principal	$690/visit plus GST
Senior Associate	$620/visit plus GST
Associate	$548/visit plus GST
Senior Engineer	$440/visit plus GST *
Geotechnician	$400/visit plus GST *

(Includes three in-situ density tests per site visit)

NOTE: * Additional times for coordination, overview and QA may be chargeable by Principal/Senior Associate/Associate in addition to these minimum charges.

As a guide, we have outlined a likely number of site inspections during construction and an estimate of costs:

Say four site inspections by an Associate (each 1 hour duration):
4 @ $548/visit: $2,192.00 plus GST.

Say four site inspections by a Senior Engineer (each 1 hour duration):
4 @ $440/visit: $1,760.00 plus GST.

Say two site inspections by a Geotechnician (each 1 hour duration):
2 @ $400/visit: $800.00 plus GST.

Paragraph 7.3.11
Completion of Council Form 3 would be completed for a lump sum fee of $300 plus GST. However, this assumes that the inspections outlined above have been completed and all other relevant information has been provided.

COST ESTIMATE SUMMARY

On the basis of the above assumptions and the estimates of our involvement outlined above, for ease of reference we provide below a brief summary of the likely costs:

Site clearance, investigations and reporting:	$8,180.00
Form 2:	$500.00
Endorse Hydraulic drawings:	$300.00
Review excavation/retention methodology:	$1,048.00
Geotechnical inspections and testing:	$4,752.00
Form 3:	$300.00
Sub Total:	$15,080.00
10% GST:	$1,508.00
Total Cost estimate:	$16,588.00

GENERAL COMMENTS

All work would be completed during normal working hours (0700 to 1700 hours Monday to Friday) at our discretion. Our summary conditions of engagement are attached.

All geotechnical advice would be reviewed by one of our Principals or senior staff members who would also carry out a Quality Assurance audit of the on-going geotechnical advice.

Please note the additional services that can be supplied:

- Soil and groundwater contamination investigations.
- Acid sulfate soil investigations.
- Soil salinity investigations.
- Waste classification for offsite disposal of soil, rock and groundwater in accordance with the NSW DECCW (formerly EPA) Environmental Guidelines. If the proposed development requires any excavation we strongly recommend this be completed prior to commencement of excavation. It is most economically completed as part of this geotechnical investigation.

Please let us know if you require any further details.

If you wish to proceed with the work, please send us your letter of commission, or work order or signed Acceptance of Proposal. If a client of yours will be paying directly for our services, please ensure that the client signs the Acceptance or issues a letter of commission on their letterhead. We will not release reports until the commission is received from the client.

Should you require further information please do not hesitate the contact the undersigned.

Regards
For and on behalf of
JEFFERY & KATAUSKAS PTY LTD

Paul Roberts
Associate

Encl: Summary Conditions of Engagement

NOTE: IF MESSAGE NOT CORRECTLY RECEIVED PLEASE TELEPHONE.

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

ABN 17 003 550 801

SUMMARY OF PROPOSAL OR QUOTATION CONDITIONS AND CONDITIONS OF ENGAGEMENT

1. A typed or handwritten facsimile message, email or letter on the letterhead of this company, prepared by a staff member of the company, represents a formal proposal.

2. We require that you promptly forward a copy of these conditions to your client if you are acting as an agent in this project.

3. We request we be formally commissioned by return of the form below or Company Purchase Order. If we proceed on the basis of verbal commission, the instructor and client will be deemed to have formally accepted these conditions. We request we be formally advised who should be invoiced for the works (ie the client) including business name, ACN/ABN and address, the relevant contact name and telephone number. Our QA System does not permit results or reports to be issued without an order, letter or fax of commission.

4. Subject to the Privacy Act 1988, the client gives consent to collection of information in relation to the client and/or client representative or advisors regarding names, addresses, contact details. Such information is used for project communications and may be stored in our data base for future retrieval of project information. Such information may be made available to third parties for the purposes of debt collection or credit referencing including notifying other credit providers by listing on national databases of a default by you.

5. If there are limiting time criteria, then please advise this information to us.

6. For the geotechnical component of the investigation, please provide us with all available survey information, indicative building, strip footing, etc. loadings prior to the commencement of our investigation. Details of all proposed basements or excavations should also be advised.

7. Information of any relevance in determining the history of the site, whether land title documents, plans, drawings, photographs or personal contacts should be provided to us and may be quoted in our report where appropriate. We hold no liability whatsoever for any inaccuracy in our report which is due to information being withheld which may invalidate our conclusions.

8. All costs associated with damaged, lost or excessively worn equipment due to drilling or EFCP testing in fill will be charged for at cost plus 10% unless agreed otherwise.

9. In providing the services, we shall exercise the degree of skill, care and diligence normally exercised by consulting engineers in similar circumstances. The services will not comply with AS1726 unless additional fees are paid for the extended brief.

10. Unless otherwise noted, this proposal is for a geotechnical investigation only; it does not provide for environmental/ contamination testing. Such testing incurs further costs and requires specialist sampling and cleaning equipment. We can complete this work if you so commission us.

11. Jeffery & Katauskas Pty Ltd (or its employees or agents) do not accept or undertake the role or responsibility of the Principal Contractor with respect to the Occupational Health & Safety Act (NSW) 2000 or the Occupational Health & Safety Regulation 2001, whether explicitly or by default or implication. Unless advised otherwise, the Client will be the Principal Contractor.

12. Our terms of payment are: Payment in full to be made within 10 business days of our invoice date. We incur substantial external and staff costs in the completion of an investigation and usually the invoice is submitted some weeks after our commitment to those costs. Therefore, if in default of payment by the due date, the client will be liable to pay Bank Overdraft and Accountancy Fees of 2.5% per month (calculated on a daily basis) on any outstanding amount and will indemnify us and pay all costs and expenses of a solicitor on an own client basis if legal action is necessary, and/or fees from a debt recovery agency (such as EC Credit Control Pty Ltd), which we may incur in recovering from the client any overdue amount. The client gives consent to completion of a credit check on that individual, company or other entity.

13. When commissioned, we will survey the relative level of each borehole location for $30+GST per location (on a small site) using a site datum or AHD if an appropriate benchmark is available close by (minimum total survey cost = $150). If survey is not requested, borehole levels will be estimated where possible from drawings or other data supplied.

14. If any other party is to be advised regarding our presence on site, we request that the names, addresses and telephone numbers of such parties be advised or, alternatively, that confirmation be given that the relevant parties have been notified and approve.

15. Drawings showing all buried services should be forwarded to us so that boreholes and test pits etc avoid any such services. We will observe for surface indications of buried services and locate boreholes away from them, however, we accept no responsibility for damaging buried services if their locations have not been accurately advised.

16. We assume that free and uninterrupted access to the site is available and trafficable for a heavy 2 wheel drive truck-mounted rig unless noted otherwise in our proposal. All costs associated with recovery of bogged vehicles or damage to vehicle and/or equipment due to site conditions will be chargeable to the client at schedule rates or cost +10% as appropriate. If a key to any gate is required, then we require this be supplied to our office prior to the commencement of the investigation, otherwise standing time will be claimed for time lost in attempting to gain access. The client shall be responsible for arranging legal access to a site prior to acceptance of our proposal. The work shall normally be within working hours of 0700 hours to 1700 hours, Monday to Friday unless noted otherwise in the proposal. Surcharges shall apply for work outside the above hours to cover penalty rates paid to staff. No allowance has been made for the following unless indicated otherwise: coring concrete or road pavements, reinstatement of disturbance to landscaped areas, site meetings, progress meetings, post report consultations and additional copies of reports. (Concrete coring usually attracts a bit wear surcharge of $4/10mm+GST.)

17. Samples will be stored for a period of 1 month from date of report and will then be discarded unless otherwise requested in writing. If samples are found to contain hazardous levels of contamination then additional charges for safe disposal may apply.

18. Our liability to the Client in respect of our commission shall be limited to either three times our invoiced amount or $25,000, whichever is the lesser. Liability shall be limited to loss arising out of or in connection with our services under this agreement to the extent that the same is due to our negligence. Our liability shall be reduced proportionally to the extent that any acts or omissions of the Client or the Client's employees, subcontractors or agents contributed to such claim, liability or loss. Our liability may be extended by negotiation. As a guide, our professional indemnity insurance may be extended to $1,000,000 and will be charged for at 2.5% of the invoiced amount or $300+GST, whichever is the greater. The requirement for additional cover must be indicated at the time of acceptance of our proposal, and the appropriate fee will be in addition to our estimate or quotation.

19. After the expiration of one (1) year from the date of invoice for any work or investigation, we shall be discharged from all liability in respect of the services provided whether under the law of contract, tort or otherwise.

20. Copyright in all documents (such as drawings, reports and specifications) provided by us shall remain the property of Jeffery and Katauskas Pty Ltd. Subject to payment of fees due, the Client alone shall have a licence to use the documents provided for the purpose of completing the project, but the Client shall not use, or make copies of, such documents in connection with any work not included in the project. If the Client is in breach of any obligation to make a payment to us, we may revoke the licence to use our documents and the Client shall then cause to be returned to us all documents provided by us and all copies thereof.

21. We are not responsible to the Client for the project design or the methods, techniques, sequences, procedures and use of equipment which are employed by the contractor or others in executing the project.

22. Termination of the commission, resolution of dispute and assigning, transfer or subletting of obligations under the commission by either party are subject to the Association of Consulting Engineers Australia (ACEA) short Form of Agreement, a copy of which can be provided if required.

23. It is essential that detailed information regarding any known or possible contamination at a site be forwarded to us prior to undertaking site work in order that we can ensure appropriate Health and Safety precautions are followed by our staff. Additional costs will be involved if protective clothing, respirators etc are required. If suspicious conditions are encountered on site, we will attempt to contact you to advise of the situation. If there is any doubt as to safety of our personnel, we will use our judgment as to appropriate precautions and the additional cost will be added to our quoted price.

24. A Certificate of Currency for Workers' Compensation, Public Liability or Professional Indemnity will be issued if requested. In the event that our invoice is not paid within our Standard Terms and Conditions time period and an updated Certificate of Currency is requested, as the previous certificate has expired, Jeffery & Katauskas Pty Ltd will charge an administration fee of $40 for this certificate.

25. **Normally one bound hardcopy and one PDF copy (on CD) of the report are provided. A fee of $40 + GST is charged for extra hardcopies of standard size reports.**

26. **The accompanying proposal only remains valid for 90 days from the date of issue. After 90 days, we reserve the right to revise our fee.**

PLEASE RETURN TO J&K
ACCEPTANCE OF PROPOSAL

TO: JEFFERY & KATAUSKAS PTY LTD.

FAX NO: 02 9888 5003

ATTENTION: PAUL ROBERTS

RE: GEOTECHNICAL ADVICE
ELANORA HEIGHTS

On Behalf Of The Client (Company or Person's Name):.....

.....

(Company ABN): .....

Address: .....

.....

A) **I (the Client) request Jeffery & Katauskas Pty Ltd to carry out the works described in their proposal (No P20992ZRextra) dated 28 January 2010.**

I am an authorised officer of that company.

..... Signature

..... Name

..... Position

..... Date

Contact Phone No:.....

Contact Fax No:.....

Postal Address for Invoice: .....

.....

If you are signing on behalf of another person, full contact details of the other person including physical address must be provided. Acceptance on behalf of another company, as Client, must be followed up with a letter of commission on the Client's company letterhead.

Specify below any limitations or instructions regarding the proposed works.

OR

B) **Jeffery & Katauskas' proposal has been unsuccessful because (specify reasons below).** ☐

NOTES:

.....

Original – 17TH April 2007

GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER
FORM NO. 1 – To be submitted with Development Application

Development Application for JASON BENNETT
Name of Applicant
Address of site 100 WAKEHURST PARKWAY, ELANDRA HEIGHTS

Declaration made by geotechnical engineer or engineering geologist or coastal engineer (where applicable) as part of a geotechnical report

I, BRUCE F WALKER on behalf of JEFFERY & KATAUSKAS PTY LTD
(Insert Name) (Trading or Company Name)

on this the 17 APRIL 2007 certify that I am a geotechnical engineer or engineering geologist or coastal engineer as defined by the Geotechnical Risk Management Policy for Pittwater and I am authorised by the above organisation/company to issue this document and to certify that the organisation/company has a current professional indemnity policy of at least $2million.
We have:

Please mark appropriate box

- Prepared the detailed Geotechnical Report referenced below in accordance with the Australia Geomechanics Society's Geotechnical Risk Management Guidelines and the Pittwater Council Policy

✓ ~~Am~~ Are willing to technically verify that the detailed Geotechnical Report referenced below has been prepared in accordance with the Australian Geomechanics Society's Geotechnical Risk Management Guidelines and the Pittwater Council Policy

- Have examined the site and the proposed development/alteration in detail and ~~am~~ are of the opinion that the Development Application only involves Minor Development/Alterations that do not require a Detailed Geotechnical risk Assessment and hence my/our report is in accordance with the Policy requirements for Minor Development/Alterations.

- Provided the coastal process and coastal forces analysis for inclusion in the geotechnical report

Geotechnical Report Details:

Report Title: GEOTECHNICAL ASSESSMENT AT 100 WAKEHURST PARKWAY, ELANDRA HEIGHTS
Report Date: 17 APRIL 2007 Report Ref No: 20992ZR.rpt
Author: PAUL DAVID ROBERTS
B.Sc., M.Sc., M.I.E. Aust

Documentation which relate to or are relied upon in report preparation:

Architectural Drawings (Drg. No's 101, 105, 201, 210, 301 & 310 dated 13/4/07) & Survey Plan (Ref. 1510 dated 14/8/06) - Prepared by Mike Foran Architecture & DP Surveying Services, respectively.

We are ~~I am~~ aware that the above geotechnical report, prepared for the abovementioned site is to be submitted in support of a Development Application for this site and will be relied on by Pittwater Council as the basis for ~~ensuring~~ confirming that the geotechnical risk management aspects of the proposed development have been adequately addressed to achieve an "Acceptable Risk Management" level for the life of the structure, taken as at least 100 years unless otherwise stated and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk. *as discussed in the Report.*

Signature Bruce F Walker
Name B.F. WALKER
Chartered Professional Status FIE Aust CP Eng
Membership No. 199312

GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER

FORM NO. 1(a) - Checklist Of Requirements For Geotechnical Risk Management Report for Development Application or Part V assessment

Development Application for JASON BENNETT
Name of Applicant
Address of site 100 WAKEHURST PARKWAY, ELANORA HEIGHTS

The following checklist covers the minimum requirements to be addressed in a Geotechnical Risk Management Geotechnical Report. This checklist is to accompany the Geotechnical Report and its certification (Form No. 1).

Geotechnical Report Details:

Report Title: GEOTECHNICAL ASSESSMENT AT 100 WAKEHURST PARKWAY, ELANORA HEIGHTS
Report Date: 17 APRIL 2007 *Report Ref. No:* 20992ZRpt
Author: PAUL DAVID ROBERTS

Please mark appropriate box

- ✓ Comprehensive site mapping conducted 28/2/07 (date)
- ✓ Mapping details presented on contoured site plan with geomorphic mapping to a minimum scale of 1:200 (as appropriate)
- Subsurface investigation required
  - No Justification .....
  - ✓ Yes Date conducted 28/2/07
- ✓ Geotechnical model developed and reported as an inferred subsurface type-section
- ✓ Geotechnical hazards identified
  - ✓ Above the site
  - ✓ On the site
  - ✓ Below the site
  - ✓ Beside the site
- ✓ Geotechnical hazards described and reported
- ✓ Risk assessment conducted in accordance with Council's Policy
  - ✓ Consequence analysis
  - ✓ Frequency analysis
- ✓ Risk calculation
- ✓ Risk assessment for property conducted in accordance with Council's Policy
- ✓ Risk assessment for loss of life conducted in accordance with Council's Policy
- ✓ Assessed risks have been compared to "Acceptable Risk Management" criteria as defined in the Geotechnical Risk Management Policy for Pittwater
- ✓ Opinion has been provided that the design can achieve the "Acceptable Risk Management" criteria provided that the ~~specified conditions are achieved~~. *recommendations presented in the Report are adopted.*
- ✓ Design Life Adopted:
  - ✓ 100 years
  - Other .....
    specify
- ✓ Development Conditions to be applied to all four phases as described in Pittwater Geotechnical Risk Management Policy have been specified
- ✓ Additional action to remove risk where reasonable and practical have been identified and included in the report.

We are ~~I am~~ aware that Pittwater Council will rely on the Geotechnical Report, to which this checklist applies, as the basis for *confirming* ~~ensuring~~ that the geotechnical risk management aspects of the proposal have been adequately addressed to achieve an "Acceptable Risk Management" level for the life of the structure, taken as at least 100 years unless otherwise stated, and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk. *as discussed in the Report.*

Signature ..... Bruce F. Walker

Name ..... B.F. WALKER

Chartered Professional Status ..... FIE Aust CP Eng

Membership No. 199312

For and on behalf of Jeffery & Katouskos Pty Ltd.

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
ABN 17 003 550 801

Principals
E H FLETCHER BSc (Eng) ME
P STUBBS BSc MICE FGS
D TREWEEK Dip Tech
B F WALKER BE DIC MS
Consultant: R P JEFFERY BE DIC MS

Senior Associates
L J SPEECHLEY BE(Hons) MEngSc
F A VEGA BSc(Eng) GDE
P C WRIGHT BE(Hons) MEngSc
A ZENON BSc(Eng) GDE

Associates
D BLISS BE(Hons) MEngSc
A JACKAMAN BE MEngSc
A KINGSWELL BSc(Hons) MSc
A B WALKER BE(Hons) MEngSc

115 WICKS ROAD
MACQUARIE PARK NSW 2113
POSTAL ADDRESS: PO BOX 976
NORTH RYDE BC NSW 1670
Tel: 02 9888 5000
Fax: 02 9888 5003

REPORT

TO

JASON BENNETT

ON

GEOTECHNICAL ASSESSMENT

(IN ACCORDANCE WITH PITTWATER COUNCIL AMENDED INTERIM POLICY)

FOR

PROPOSED RESIDENTIAL SUBDIVISION

AT

100 WAKEHURST PARKWAY, ELANORA HEIGHTS, NSW

17 April 2007

Ref:20992ZRrpt

TABLE OF CONTENTS

1 INTRODUCTION

This report presents the results of our geotechnical assessment of the site at 100 Wakehurst Parkway, Elanora Heights, NSW. The assessment was commissioned by Mike Foran of Mike Foran Architecture, on behalf of Jason Bennett, in accordance with our proposal (Ref: P13699ZR) dated 29 January 2007. The site was inspected by the undersigned on 28 February 2007, in order to assess the existing stability of the site and the effect on stability of the proposed development.

Details of the proposed development are presented in Section 5 below. In summary, however, it is proposed to create a new subdivision comprising alterations and additions to the existing dwelling, construction of a new two and three storey residence, two new double garages together with a new driveway access. Minimal site filling and excavations to a maximum depth of about 3m are anticipated.

This report has been prepared in accordance with the requirements of the Amended Interim Geotechnical Risk Management Policy for Pittwater (adopted 17 June 2003) as discussed in Section 6 below. It is understood that the report will be submitted to Council as part of the DA documentation. Our report is preceded by the completed Council Forms 1 and 1a.

2 ASSESSMENT METHODOLOGY

2.1 Walkover Survey

The stability assessment is based upon a detailed inspection of the topographic, surface drainage and geological conditions of the site and its immediate environs. These features were compared to those of other similar lots in neighbouring locations to provide a comparative basis for assessing the risk of instability affecting the proposed development. The attached Appendix A defines the terminology adopted

for the risk assessment together with a flow chart illustrating the Risk Management Process based on the guidelines given in AGS 2000 (Reference 1).

A summary of our observations is presented in Section 3 below. Our specific recommendations regarding the proposed development are discussed in Section 7 following our geotechnical assessment.

The attached Figure 1 presents a geotechnical site plan showing the principal geotechnical features present at the site. Figure 1 is based on the survey plan prepared by DP Surveying Services (Ref: 1510 dated 14 August 2006) and an earlier version of the provided architectural drawing (Dwg. No: 101 dated 15 March 2007) prepared by Mike Foran Architecture. Additional features on Figure 1 have been measured by hand held inclinometer and tape measure techniques and hence are only approximate. Should any of the features be critical to the proposed development, we recommend they be located more accurately using instrument survey techniques. Figure 2 presents a typical cross-section through the site based on the survey data, an earlier version of a supplied cross section prepared by Mike Foran Architecture (Dwg. No: 310 dated 15 March 2007) augmented by our mapping observations.

2.2 Subsurface Investigation

The subsurface investigation was completed using manually operated equipment and comprised three Dynamic Cone Penetration (DCP) tests (DCP1, DCP2 & DCP3). The DCP tests were extended to refusal depths of about 4.7m, 0.3m and 0.4m, respectively.

The locations of the DCP tests shown on the attached site plan (Figure 1) were set out by taped measurements from existing surface features and apparent site boundaries. The surface reduced levels (RLs) at the DCP locations were

determined by interpolation between spot levels on the provided survey plan prepared by DP Surveying Services (Ref: 1510 dated 14 August 2006). The site datum is Australian Height Datum (AHD).

The state of compaction and relative density of the fill and natural sandy soils was assessed from the DCP test results. The DCP test refusal depth can also indicate the depth to bedrock although the presence of detached blocks of sandstone within the natural soils or large obstructions within fill materials cannot be discounted. Further details of the investigation methods are presented in the Report Explanation Notes.

Our Senior Engineering Geologist set out the DCP tests. The DCP tests were completed by our Geotechnical Engineer and the DCP test results sheet is attached.

Laboratory geotechnical testing was not carried out, as it was not deemed appropriate. Contamination testing of site soils and groundwater was outside the scope of this investigation.

3 SUMMARY OF OBSERVATIONS

We recommend that the summary of observations which follows be read in conjunction with the attached Figures 1 and 2.

- The site is located on the northern side of Wakehurst Parkway, which for descriptive purposes has been assumed to be orientated east-west. Wakehurst Parkway was paved with asphaltic concrete with a grass surfaced road reserve located on both sides of the road. Wakehurst Parkway appears to be located on, and lines, the relatively flat northern foreshore of Narrabeen Lakes.
- The lot area is rectangular in shape being about 15m wide (east to west) and about 148m long.

- Access to the site was by a concrete surfaced driveway leading up to a relatively flat paved southern central level and the existig garage. From the rear of the existing garage, the northern central level area of the site then stepped up approximately 4m vertical height over detached sandstone blocks and possible sandstone bedrock outcrops to a relatively flat grass surfaced area.

- A very large detached sandstone block was located immediately to the rear of the existing garage and was about 6m wide (east-west), 5m long (north-south) and about 4.5m high. A number of detached sandstone blocks were located to the north of the very large block and ranged up to a maximum size of about 1.5m x 2.0m x 3.0m. A fig tree was growing on top of the pile of blocks and root jacking of individual blocks was evident.

- To the west of the above described area of various sized detached sandstone blocks, the uneven grassed surface sloped down to the west at a maximum of about 30°. To the north of the sandstone blocks, the relatively flat grass surfaced area extended to the north to a series of overgrown masonry and stacked sandstone walls (orientated east-west, ranging between about 1m and 2m height) that stepped up a maximum vertical height of approximately 3m.

- Above the series of overgrown stacked sandstone walls, the northern portion of the site then sloped up at a maximum of about 35° to the base of an east - west trending vertical sandstone cliff line (about 8m high). The slope surface contained a number of trees ranging from about 5m to 25m in height, and some of the trunks of the trees had curved bases. The slope surface also contained a number detached sandstone blocks ranging between approximately 0.5m x 0.5m and 2.5m x 2.5m plan dimension. In addition, the slope surface contained a number of steps of about maximum 0.5m height formed by dwarf sandstone block walls and sandstone outcrops.

- The vertical sandstone cliff face zig zagged across the site and extended beyond the site boundaries to the east and west. The zig zagging of the sub-

vertical faces to the sandstone cliff appeared to be formed by planar joints orientated approximately 010° and intersected by approximately orthogonal jointing orientated about 310°. The planar joints generally extended the full vertical height of the cliff and were intersected by sub-horizontal bedding partings. At the intersection of the orthogonal jointing, the joint that trended about 310° (sub-parallel to this section of the cliff face) extended to the north-west into the cliff face and was open a maximum width of about 0.5m. To the east, a joint trending about 010° extended to the north into the cliff face and was open a maximum width of about 0.3m. The defects were partially filled with small blocks of sandstone, vegetation and soil. A sandstone block at the top of the cliff extended out over the open defect plane that trended about 310°. At the eastern end of the cliff face (and crosing the site boundary) an undercut feature was recorded which was about 1m vertical height and which extended back a horizontal distance of about 1m. The thickness of the vegetation across the base of the cliff and stockpiled corrugated metal sheets prevented more detailed observations.

- Above the cliff top area, a densely vegetated convex bushland slope extended up to the northern site boundary at grades of between about 10° and 15°. We note that access to this upper portion of the site was not possible and observations have been based on a visual assessment from the slope below and the results of a previous assessment completed on properties to the west (No. 104 and 106 Wakehurst Parkway).

- At the time of the assessment the southern portion of the subject site was occupied by a two storey brick house with a brick garage located at the end of the driveway. Portions of the yard areas were concrete surfaced and the driveway was also concrete paved. Low height brick walls formed the outline of a former rear yard pool. The structures and paved surfaces were generally in reasonably good condition, however the paved surfaces contained a number of

hairline to 10mm wide cracks. In addition, the south-western corner of the garage wall contained a stepped crack of maximum 3mm width.

- The gently sloping grass surfaced front yard areas of the subject site contained a number of trees and shrubs (ranging between about 5m and 15m height). Steps within the front yard surface were supported by stacked sandstone and brick masonry retaiing walls of maximum height about 0.7m. The walls appeared to be in reasonable condition.
- The sandstone exposed at the faces of the outcrops and cliff faces described above was generally distinctly to slightly weathered and of medium strength. Sub-horizontal bedding partings were typically 2m to 4m apart and cross bedding, where noted, sloped down to the south-west at between about 15° to 20°.
- Existing houses of two storey brick and weatherboard construction (No. 102 Wakehurst Parkway) and one storey brick construction (No. 98 Wakehurst Parkway) were set-back about 1m from the southern ends of the eastern and western site boundaries. Based on a cursory inspection from within the subject site the neighbouring residences and structures were in good condition. However a dilapidated timber shed lined a short section of the eastern site boundary.
- Site surface levels across the eastern and western site boundaries appeared to be similar apart from the following selected sections:
    - The central section of the western site boundary which stepped down to the west a maximum of about 1m with the subject site supported by a brick retaining wall.
    - The eastern side of the front yard surface stepped down to the east a maximum of about 0.3m and concrete and brick walls supported the subject site. The neighbouring side of the southern end of the eastern

site boundary was covered by stockpiled building materials which prevented further observations.

- A short length of the central section of the eastern site boundary stepped up to the east a maximum of about 0.5m. The neighbouring site surface was supported by a dilapidated stacked sandstone, brick and ceramic pipe wall.

4 SUBSURFACE CONDITIONS

The 1:100,000 geological map of Sydney indicates that the site lies close to the boundary between the Hawkesbury Sandstone and the underlying Newport Formation of the Narrabeen Group which comprises interbedded sandstones and shale. The cliff face crossing the site revealed the Hawkesbury Sandstone. In addition, a limited extent of fill and Quaternary Age transgressive dune sands of marine origin are expected towards the front (southern portion) of the site. Some of the more pertinent subsurface issues or considerations are outlined below.

- Based on the DCP test results, any fill present below the site would be assessed to be poorly compacted. The (assumed) natural sands are generally of very loose and loose relative density to depths ranging from about 0.1m to 2.2m. It is possible that the blow counts of at least 10 per 100mm encountered below depths of about 0.1m (DCP3), 0.3m (DCP2) and 4.6m (DCP1) may represent natural residual soils which then extended down to the refusal depths of the DCP tests, at about 0.4m(DCP2 and DCP3) and 4.7m (DCP1).
- The refusal depths of the DCP tests are inferred to be the top of bedrock although the presence of a 'floater' or band of rock within the natural residual soil profile cannot be discounted.

- Groundwater was not encountered over the depth of the investigation. No evidence of groundwater seepage was noted on the extracted DCP rods.

5 PROPOSED DEVELOPMENT

We understand, from the provided architectural drawings (Drawing Nos 101, 105, 201, 210, 301 and 310 dated 13 April 2007) prepared by Mike Foran Architecture, that the proposed development will comprise the following:

- Proposed alterations and additions to the existing house comprising reconfiguration of the western side of the house and a new deck located on the front (southern end) of the house. Demolition of selected sections of the existing house will be required.
- Demolition of the existing driveway and construction of a new driveway (essentially at similar sfinished surface levels) lining the western site boundary. Widening of selected lengths of the driveway will be required together with some localised excavation (maximum about 0.5m depth) and filling (maximum about 0.5m thick) along the southern end of the new driveway.
- Demolition of the existing garage and construction of two new double garages with finished floor levels of RL8.55m and RL10.0m. Excavations down to maximum dpeths of about 1.0m and 2.0m, respectively will therefore be required.
- Construction of a new one and three level residence with finished floor levels of RL18.15m, RL20.85m and RL23.55m. Excavations back into the existing hillside will be required and will extend ot depths ranging between about 1.0m and 3.0m.
- Landscaping along the eastern side of the new residence comprising steps and two decks. In addition, a 4,000 litre rainwater tank, 1,500 litre on site

detention system and a 5,000 litre bush fire water tank will located adjacent to the south-western corner of the new residence.

The footprint of the proposed development is indicated on Figure 1.

6 GEOTECHNICAL ASSESSMENT

The subject site is dissected by an approximately east to west trending cliff line with an upper bushland portion gently sloping down to the cliff edge. Below the vertical cliff the site then slopes at moderate grades down to the relatively flat lower (southern) portion. Over the central and northern portions of the site bedrock is expected at shallow depth, then increasing to greater depths towards the Narrabeen Lake foreshore to the south. The site appeared to be relatively well drained.

The southern gently sloping portion of the site showed no obvious signs of instability, which is to be expected for such shallow slope angles.

The steeper sloping central portion of the site (extending to the south from the base of the cliff face) was characterised by uneven surfaces and curved bases to trees. Based on the above, ongoing downslope creep of natural soils down the central portion of the site is expected.

The detached blocks strewn along the cliff base and extending down to the flatter portion of the site and evidence of detached blocks at or close to the crest of the cliff indicate that blocks have fallen and toppled from the existing cliff face. The detached sandstone blocks are likely to have been derived from collapse of overhang features or isolated blocks of sandstone controlled by intersecting defect planes within the cliff face above and this process is expected to continue over geological time.

6.1 Potential Landslide Hazards

Our geotechnical assessment of the risk of instability is based on the methodology proposed by AGS 2000 (Reference 1), the Interim Geotechnical Risk Management Policy for Pittwater (June 2003), and the relevant site features illustrated on Figure 1. The potential landslide hazards for the site are associated with the following:

a Instability of existing slopes and retaining walls above and below the existing and proposed residences:

(i) The cliff face crossing the rear portion of the site including detached blocks falling from the cliff face.

(ii) The detached sandstone blocks and possible outcrops within the slope below the base of the cliff.

(iii) The existing stacked sandstone walls located across the hill slope above and below the existing and proposed residences.

(iv) The existing retaining walls supporting short sections of the eastern and western site boundaries above and below the existing and proposed residences.

b Instability of temporary and permanent excavation batters associated with the new double garages and the new residence over the central portion of the site.

c Instability of proposed retaining walls along the northern end of the proposed double garages and residence over the central portion of the site.

Some of these potential hazards are indicated in schematic form on the attached Figure 2 which has been based on the section presented on an earlier provided

architectural drawing (Drawing No 310 dated 15 March 2007) prepared by Mike Foran Architecture.

6.2 Risk Analysis

The attached Table A summarises our qualitative assessment of each potential landslide hazard and of the consequences to property should the landslide hazard occur.

Based on the above, the qualitative risks to property have been determined. The terminology adopted for this qualitative assessment is in accordance with Table A1 given in Appendix A. Table A indicates that the assessed risk to property under existing conditions is "Very Low to Low" which would be considered 'acceptable' in accordance with the criteria given in Reference 1 and the Pittwater Council Amended Interim Policy. In addition, for the proposed development, provided the recommendations outlined in Section 7 below are implemented, the assessed risk to property is "Very Low" which would also be considered 'acceptable' in accordance with the criteria given in Reference 1 and the Pittwater Council Amended Interim Policy.

We have also used the indicative probabilities associated with the assessed likelihood of the landslide hazards occuring to calculate the risk to life. The temporal, vulnerability and spatial factors that have been adopted are given in the attached Table B together with the resulting risk calculation. Our assessed risk to life for the person most at risk, assuming the recommendations outlined in Section 7 are adopted, is about 10^{-7} or less. This would be considered to be 'acceptable' in relation to the criteria given in Reference 1 and the Pittwater Council Amended Interim Policy.

6.3 Risk Assessment

The Pittwater Amended Interim Policy requires suitable measures 'to remove risk'. It is recognised that, due to the many complex factors that can affect a site, the subjective nature of a risk analysis, and the imprecise nature of the science of geotechnical engineering, the risk of instability for a site and/or development cannot be completely removed. It is, however, essential that risk be reduced to at least that which could be reasonably anticipated by the community in everyday life and that landowners be made aware of reasonable and practical measures available to reduce risk as far as possible. Hence, where the policy requires that 'reasonable and practical measures have been identified to remove risk', it means that there has been an active process of reducing risk, but it does not require the geotechnical engineer to warrant that risk has been completely removed, only reduced, as removing risk is not currently scientifically achievable.

Similarly, the Pittwater Interim Policy requires that the design project life be taken as 100 years unless otherwise justified by the applicant. This requirement provides the context within which the geotechnical risk assessment should be made. The required 100 years baseline broadly reflects the expectations of the community for the anticipated life of a residential structure and hence the timeframe to be considered when undertaking the geotechnical risk assessment and making recommendations as to the appropriateness of a development, and its design and remedial measures that should be taken to control risk. It is recognised that in a 100 year period external factors that cannot reasonably be foreseen may affect the geotechnical risks associated with a site. Hence, the Policy does not seek the geotechnical engineer to warrant the development for a 100 year period, rather to provide a professional opinion that foreseeable geotechnical risks to which the development may be subjected in that timeframe have been reasonably considered.

Our assessment of the probability of failure of existing structural elements such as retaining walls (where applicable) is based upon a visual appraisal of their type and

condition at the time of our inspection. Where existing structural elements such as retaining walls will not be replaced as part of the proposed development, where appropriate we identify the time period at which reassessment of their longevity seems warranted.

In preparing our recommendations given below we have adopted the above interpretations of the Interim Policy requirements. We have also assumed that no activities on surrounding land which may affect the risk on the subject site would be carried out. We have further assumed that all Council's buried services are, and will be regularly maintained to remain, in good condition.

We consider that our risk analysis has shown that the site and existing and proposed development can achieve the 'Acceptable Risk Management' criteria in the Pittwater Interim Policy provided that the recommendations given in Section 7 below are adopted. These recommendations form an integral part of the Landslide Risk Management Process.

7 COMMENTS AND RECOMMENDATIONS

We consider that the proposed development may proceed provided the following specific design, construction and maintenance recommendations are adopted to maintain and reduce the present risk of instability of the site and to control future risks. These recommendations address geotechnical issues only and other conditions may be required to address other aspects.

7.1 Conditions Recommended to Establish the Design Parameters

7.1.1 The lower portion of the western wall of the existing double garage lining a short section of the western site boundary currently supports the subject site. Demolition of the existing double garage must be completed with care

so as not to damage or de-stabilise the portion of the wall supporting the subject site. The wall is cracked and requires strengthening or replacing. In addition, if the existing retaining wall located immediately below (to the south) of the proposed new residence is to remain, then assessment of the strength and stability of the wall by a structural and geotechnical engineer will be required. The assessment may include excavation of test pits to reveal existing footings. Based on the results of the assessment, the wall may need to be strengthened or replaced. Retaining wall design parameters are provided below.

7.1.2 Prior to site clearance and excavation for the proposed new residence being carried out, we recommend that a temporary catch fence be provided and located to the east and west of the large boulder located above the existing double garage. The catch fence is required to prevent detached blocks that may fall from the slope above rolling downslope and impacting existing or proposed buildings and structures. The catch fence would need to be socketted into sandstone bedrock and its design may be completed following additional geotechnical investigations.

7.1.3 Access to the base and crest of the existing cliffline crossing the rear of the site was restricted. We recommend that before construction commences, access be provided to the crest of the cliff in order that a geotechnical engineer check for any potentially unstable blocks of sandstone. In addition, the base of the cliff should be cleared of vegetation and stockpiled materials to allow geotechnical inspection of any potentially unstable undercut features. If any stabilisation measures are required, such as rock bolts, removal of potentially unstable blocks and/or underpins they would be detailed following the geotechnical inspections. The stabilisation measures (if required) would need to be completed following construction of the catch fence (described in paragraph 7.1.2 above) and before the commencement of demolition and construction works.

7.1.4 Subject to inspection by a geotechnical engineer temporary batters for the proposed excavations should be no steeper than 1V in 2H within the sandy soil profile, no steeper than 1V in 1H within the extremely weathered rock and vertical in competent rock. The excavation faces must be progressively inspected by a geotechnical engineer to assess the stability of any detached sandstone blocks and excavation faces through sandstone bedrock. This is of particular importance with regard to the excavations for the new double garage immediately below the large detached block of sandstone and the new residence above. Stabilisation measures such as rock bolting and/or underpinning may be required. All surcharge and footing loads must be kept well clear of the excavation perimeter.

7.1.5 Where anchors and/or rock bolts are to run below adjoining properties (believed to be unlikely), then the permission of the owners must be obtained before installation.

7.1.6 Individual structures must be uniformly founded within similar materials.

- The new residence over the central portion of the site must be founded in sandstone bedrock. The footings should be designed for an allowable bearing pressure of 600kPa, subject to inspection by a geotechnical engineer prior to pouring.
- Proposed alterations and additions to the existing residence over the front (southern) portion of the site may be founded within similar materials as the existing footings. Based on the investigation results, we expect the existing residence to be founded within natural sands of at least loose relative density. However, this should be confirmed by excavation of test pits to confirm the nature and extent of existing footings and founding materials. This is of particular importance if existing footings are to be subjected to additional loads and further analysis and advice regarding expected settlements would need to be provided following excavation of the test pits. Therefore once the

structural loads have been finalised, and the test pits to reveal existing footings have been excavated, bearing capacity and settlement analyses to assess the suitability of the existing and any new high level footings should be completed. As a guide, new pad footings (1m square) founded at a depth of at least 0.5m may be designed for a maximum allowable bearing pressure of 100kPa. Total settlements of the order of 5mm to 10mm are predicted and are expected to occur "instantaneously" as the loads are applied (i.e during the construction period). In any event, we recommend that confirmatory DCP testing of the bases of any new footing excavations within the natural sands be carried out to confirm our assumptions regarding the relative density of the (assumed) natural sands.

- The proposed double garages and the water storage tanks over the central portion of the site may be uniformly founded within either natural sands of at least loose relative density or bedrock in accordance with the guidelines provided above.

7.1.7 The surface water discharging from the new and existing roofs and paved areas must be diverted via lined channels or PVC pipes to outlets for controlled discharge to the existing stormwater system which we assume drains down to Wakehurst Parkway. In addition, we recommend a cut-off drain above the proposed new residence be provided to intercept surface water run-off from upslope and connected to the existing stormwater system.

7.1.8 The proposed new retaining walls should be designed using the following parameters:

- We assume the walls will be restrained by the proposed structures then backfilled and so we recommend the adoption of a triangular lateral earth pressure distribution and an 'at rest' earth pressure coefficient, K_o, of 1, for the retained height, assuming a sloping retained surface of

maximum 35°. For the proposed garages, the retained surface will be sloping at maximum of about 10° and an 'at rest' earth pressure coefficient, K_o, of 0.6, for the retained height may be adopted.

- Landscape walls, where ground surface movements are assumed to be of little concern, may be designed using a triangular lateral earth pressure distribution and an 'active' earth pressure coefficient, K_a, of 0.85, for the retained height, assuming a sloping retained surface of maximum 35°. For retained surfaces sloping at less than a maximum of about 10° an 'active' earth pressure coefficient, K_a, of 0.35, for the retained height may be adopted.
- A bulk unit weight of 20kN/m^3 should be adopted for the soil profile.
- Any surcharge affecting the walls (eg. site traffic loading, live loading, compaction stresses, footings etc) should be allowed in the design.
- The retaining walls should be provided with complete and permanent drainage of the ground behind the walls. The subsoil drains should incorporate a non-woven geotextile fabric, eg. Bidim A34, to act as a filter against subsoil erosion.
- Toe resistance of retaining walls may be achieved by keying the footing into bedrock below the base of any nearby service trench excavations. An allowable lateral stress of 200kPa may be adopted for key design assuming horizontal ground in front of the toe. However the presence of a step down in the sandstone bedrock in front of the key cannot be discounted and additional geotechnical investigation and inspections are recommended. Alternatively, toe resistance of retaining walls may be provided by the passive pressure of the natural sands below bulk excavation level. A 'passive' earth pressure coefficient, K_p, of 3 may be adopted, provided a Factor of Safety of 2 is used in order to reduce deflections. The upper 0.3m below bulk excavation level should be

ignored in this analysis in order to take excavation tolerances into account. Localised excavations in front of the walls, e.g. for buried services should also be taken into account in the design.

7.1.9 Where localised filling is required to achieve site levels such as for proposed driveway access to the garages, after stripping of all root affected soils, the subgrade must be proof rolled. The proof rolling should be carried out using a small (say 2 tonne) smooth drum vibratory roller. During proof rolling and/or compaction, adjoining structures must be closely monitored by the site supervisor and if there are causes for concern then the static (no-vibration) mode should be used or work immediately stop and this office be contacted for further advice.

7.1.10 Engineered fill must be free of organic materials, other contaminants and deleterious substances and have a maximum particle size not exceeding 40mm. Engineered fill should be placed in layers of maximum 100mm loose thickness and compacted to achieve a Minimum Density Index of 70% (sandy fill materials) or at least 98% of Standard Maximum Dry Density (excavated sandstone). Compaction of backfill behind retaining walls is likely to require the use of hand held vibrating plate (or "wacker packers") compactors. Confirmatory DCP testing or insitu density testing should be undertaken to assess compaction. Any areas of insufficient compaction will require reworking. DCP test blow counts of the order of at least 4 blows per 100mm would need to be achieved.

7.1.11 The effluent system should be piped and discharged to the main sewer system.

7.1.12 The guidelines for Hillside Construction given in Appendix B should also be adopted.

7.2 Conditions Recommended to the Detailed Design to be Undertaken for the Construction Certificate

7.2.1 The additional geotechnical investigations and inspections referred to in the preceding paragraphs 7.1.1, 7.1.2, 7.1.3 and 7.1.6 are be completed prior to completion of design drawings.

7.2.2 All structural design drawings must be reviewed by the geotechnical engineer who should endorse that the recommendations contained in this report have been adopted in principle.

7.2.3 The structural engineer must indicate on the structural drawings the design life of all structures and structural elements.

7.2.4 All hydraulic design drawings must be reviewed by the geotechnical engineer who should endorse that the recommendations contained in this report have been adopted in principle.

7.2.5 Dilapidation surveys must be carried out on the neighbouring buildings and structures to the east and west. A copy of the dilapidation report must be provided to the neighbours and Council or the Principle Certifying Authority.

7.2.6 An excavation/retention methodology must be prepared prior to bulk excavation commencing, with particular reference to excavation, support or removal of detached sandstone blocks within and in close proximity to the excavation. The methodology must include but not be limited to proposed excavation techniques, the proposed excavation equipment, excavation sequencing, geotechnical inspection intervals or hold points, vibration monitoring procedures, monitor locations, monitor types, contingency plans in case of exceedances.

7.2.7 The excavation/retention methodology must be reviewed and approved by the geotechnical engineer.

7.3 Conditions Recommended During the Construction Period

7.3.1 Any localised stabilisation measures that may be required to the cliff face at the rear of the site must be witnessed by the geotechnical engineer.

7.3.2 The geotechnical engineer must inspect all footing excavations prior to placing reinforcement or pouring the concrete.

7.3.3 The approved excavation/retention methodology must be followed and no revisions made without the prior approval of the geotechnical engineer.

7.3.4. Bulk excavations must be progressively inspected by the geotechnical engineer as excavation proceeds. We recommend inspections at 1.5m vertical depth intervals and on completion.

7.3.5 Proposed material to be used for engineered fill and backfilling behind retaining walls must be approved by the geotechnical engineer prior to placement.

7.3.6 Where fill is placed as engineered fill testing should be undertaken to check compliance with the earthworks specifications. The frequency of density tests should be at least one test per layer (or 200mm thickness), or three tests per visit, whichever requires the greater number of tests. Compaction density of the backfill material behind retaining walls must also be checked by confirmatory DCP testing as outlined in Section 7.1.10 above. The earthworks testing should be undertaken by a NATA registered laboratory to at least Level 2 in accordance with, and to the frequency outlined in, AS3798, and the results submitted to the geotechnical engineer.

7.3.7 If they are to be retained, the existing stormwater system, sewer and water mains must be checked for leaks by using static head and pressure tests under the direction of the hydraulic engineer or architect, and repaired if found to be leaking.

7.3.8 The geotechnical engineer must inspect all subsurface drains prior to backfilling.

7.3.9 An 'as-built' drawing of all buried services at the site must be prepared (including all pipe diameters, pipe depths, pipe types, inlet pits, inspection pits, etc).

7.3.10 All rock anchors and rock bolts should be socketted into sandstone of at least low strength and designed on the basis of an allowable bond strength of 100kPa. All rock anchors must be proof-tested to 1.3 times the working load. In addition, the anchors must be subjected to lift-off testing no sooner than 24 hours after locking off at the working load. The lift off tests shall be measured by load/extension measurement techniques. The proof-testing and lift-off tests must be witnessed by the geotechnical engineer. The anchor contractor must provide the geotechnical engineer with all field records including anchor installation and testing records.

7.3.11 The geotechnical engineer must confirm that the proposed development has been completed in accordance with the geotechnical reports. It is noted that this will require completion of the inspections outlined above. Should the inspections not be completed, then the geotechnical engineer may not be able to complete Form 3, which is required by Council prior to issue of the Occupation Certificate.

7.4 Conditions Recommended for Ongoing Management of the Site/Structure(s)

The following recommendations have been included so that the current and future owners of the subject property are aware of their responsibilities:

7.4.1 All existing and proposed surface (including roof) and subsurface drains must be subject to ongoing and regular maintenance by the property owners, including checking for leaks. In addition, such maintenance must also be carried out by a plumber at no more than ten yearly intervals;

including provision of a written report confirming scope of work completed (with reference to the 'as-built' drawing) and identifying any required remedial measures

7.4.2 The existing cliff face above the proposed development must be inspected by an experienced geotechnical engineer/engineering geologist at five yearly intervals; including provision of a written report confirming scope of work completed and identifying any required remedial measures.

7.4.3 Any existing retaining walls lining the southern portions of the eastern and western site boundaries must be inspected by a structural engineer at no more than five yearly intervals; including the provision of a written report confirming scope of work completed and identifying any required remedial measures.

7.4.4 No cut or fill in excess of 0.5m (eg. for landscaping, buried pipes, retaining walls, etc), is to be carried out on site without prior consent from Pittwater Council.

7.4.5 Where the structural engineer has indicated a design life of less than 100 years then the structure and/or structural elements must be inspected by a structural engineer at the end of their design life; including a written report confirming scope of work completed and identifying the required remedial measures to extend the design life over the remaining 100 year period.

8 OVERVIEW

It is possible that the subsurface soil, rock or groundwater conditions encountered during construction may be found to be different (or may be interpreted to be different) from those inferred from our surface observations in preparing this report. Also, we have not had the opportunity to observe surface run-off patterns during heavy rainfall and cannot comment directly on this aspect. If conditions appear to

be at variance or cause concern for any reason, then we recommend that you immediately contact this office.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. Copyright in this report is the property of Jeffery and Katauskas Pty Ltd. We have used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report. The report shall not be reproduced except in full.

Should you have any queries regarding this report, please do not hesitate to contact the undersigned.

Paul Roberts
Senior Engineering Geologist

Agi Zenon
Senior Associate
For and on behalf of
JEFFERY AND KATAUSKAS PTY LTD

Reference 1: Australian Geomechanics Society (2000) *'Landslide Risk Management Concepts and Guidelines'*, Australian Geomechanics, Vol 35, No 1, March 2000, pp49-92.

TABLE A
SUMMARY OF RISK ASSESSMENT TO PROPERTY

Potential Landslide Hazard	EXISTING CONDITIONS				DURING AND AFTER COMPLETION OF PROPOSED DEVELOPMENT AND IMPLEMENTATION OF RECOMMENDATIONS OUTLINED IN SECTION 7					
	a: Instability of existing slopes and retaining walls above the existing and proposed residences				a: Instability of existing slopes and retaining walls above the existing and proposed residences				b: Instability of Temporary Excavation Batters	c: Instability of Proposed Retaining Walls
	(i) Cliff Face at Rear of Site	(ii) Detached Blocks and Outcrops below the Cliff Face	(iii) Existing Stacked sandstone walls across the Hill Slope	(iv) Existing Walls Supporting Sections of eastern & Western Site Boundaries	(i) Cliff Face at Rear of Site	(ii) Detached Blocks and Outcrops below the Cliff Face	(iii) Existing Stacked sandstone walls Across the Hill Slope	(iv) Existing Walls Supporting Sections of Eastern & Western Site Boundaries		
Assessed Likelihood	Unlikely	Unlikely	Possible	Possible	Rare				Unlikely	Rare
Assessed Consequences	Insignificant	Insignificant to minor	Insignificant	Insignificant	Minor				Minor	Minor
Risk	Low	Low	Very Low	Very Low	Very Low				Very Low	Very Low
Comments	Assumes sandstone block will not roll considerable distance downslope, as evident on existing slope.	Boulders appear to be embedded into the slope surface and will not roll considerable distance downslope.	If any of the existing walls fail, the wall debris assessed not to travel considerable distance downslope	If any of the existing walls fail, the wall debris assessed not to travel considerable distance downslope	Assumes recommended stabilisation measures adopted	Assumes recommended batter slopes and/or stabilisation measures adopted	Assumes existing walls removed and recommended stabilisation measures adopted	Assumes recommended stabilisation measures adopted	Assumes recommended batter slopes will be adopted and excavation batters inspected by geotechnical engineer	Assumes the retaining walls will be properly engineered

TABLE B
SUMMARY OF RISK ASSESSMENT TO LIFE
(After Implementation of Recommendations Outlined in Section 7)

Potential Landslide Hazard	a: Instability of existing slopes and retaining walls above the existing and proposed residences				b: Instability of Temporary Excavation Batters	c: Instability of Proposed Retaining Walls
	(i)	(ii)	(iii)	(iv)		
Assessed Likelihood	Rare	Rare	Rare	Rare	Unlikely	Rare
Indicative Annual Probability	10^{-3}	10^{-3}	10^{-3}	10^{-3}	10^{-4}	10^{-3}
Persons at Risk	Persons in rear yard	Persons in rear yard	Persons in rear yard	Persons in rear yard	Persons at crest OR Workers within excavation	Persons within new residence
Number of Persons Considered	2	2	2	2	2	2
Duration of Use of Area Affected (Temporal Probability)	1hr/day each i.e. 0.04	1hr/day each i.e. 0.04	1hr/day each i.e. 0.04	1hr/day each i.e. 0.04	1hr/day each over say 6 weeks i.e. 4.6×10^{-3} OR 8hrs/day each over say 6 weeks i.e. 0.03	6hrs/day each i.e. 0.25 OR 20hrs/day each i.e. 0.83
Probability of Not Evacuating Area Affected	0.4	0.4	0.4	0.4	0.4	0.4
Spatial Probability	1m wide block of sandstone over 10m length of cliff face i.e. 0.1	Maximum 5m wide block of sandstone over 10m length of slope i.e. 0.5	1m failure over 8m length of wall i.e. 0.13	1m failure over 5m length of wall i.e. 0.2	1m failure over approximately 6m of excavation i.e. 0.17	1m failure over 6m length of wall i.e. 0.17
Vulnerability to Life if Failure Occurs Whilst Person Present	0.1 (person some distance from cliff) 0.8 (person at base of cliff)	0.1	0.1	0.1	0.1	0.1
Risk for Person Most at Risk	1.6×10^{-3} (person some distance from cliff) 1.3×10^{-2} (person at base of cliff)	2.0×10^{-4}	2.1×10^{-4}	3.2×10^{-4}	3.1×10^{-4} OR 2.0×10^{-3}	1.7×10^{-4} OR 5.8×10^{-4}
Total Risk	3.2×10^{-3} (person some distance from cliff) 2.6×10^{-2} (person at base of cliff)	4.0×10^{-4}	4.2×10^{-4}	6.4×10^{-4}	6.2×10^{-4} OR 4.0×10^{-3}	3.4×10^{-4} OR 1.1×10^{-3}

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CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

DYNAMIC CONE PENETRATION TEST RESULTS

Client:	MR JASON BENNETT		
Project:	PROPOSED RESIDENTIAL SUBDIVISION		
Location:	100 WAKEHURST PARKWAY, ELANORA HEIGHTS, NSW		
Job No.	20992ZR	Hammer Weight & Drop:	9kg/510mm
Date:	28-2-07	Rod Diameter:	16mm
Tested By:	J.C.	Point Diameter:	20mm

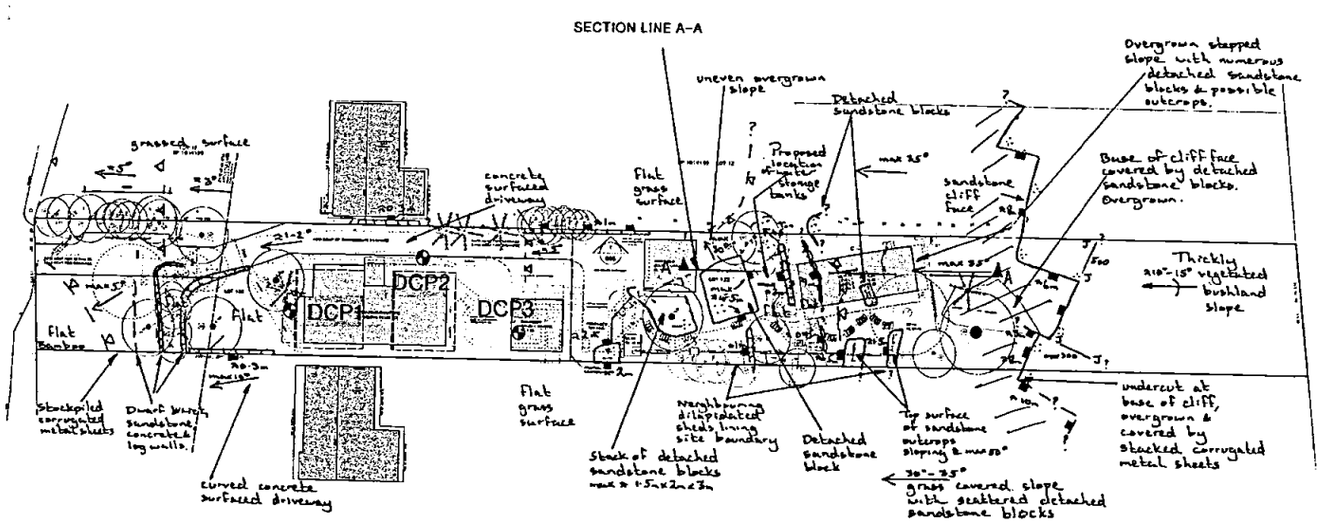
Number of Blows per 100mm Penetration

Test Location	RL ~7.3m	RL ~7.5m	RL ~8.2m	Test Location			
Depth (mm)	1	2	3	Depth (mm)	1		
0 - 100	SUNK	5	2	3000-3100	6		
100 - 200	↓	6	10	3100-3200	9		
200 - 300	2	4	16	3200-3300	10		
300 - 400	2	20/10mm	16/50mm	3300-3400	9		
400 - 500	3	REFUSAL	REFUSAL	3400-3500	9		
500 - 600	3			3500-3600	6		
600 - 700	3			3600-3700	7		
700 - 800	3			3700-3800	7		
800 - 900	2			3800-3900	4		
900 - 1000	5			3900-4000	4		
1000 - 1100	2			4000-4100	5		
1100 - 1200	4			4100-4200	5		
1200 - 1300	4			4200-4300	4		
1300 - 1400	2			4300-4400	5		
1400 - 1500	1			4400-4500	5		
1500 - 1600	1			4500-4600	9		
1600 - 1700	1			4600-4700	15		
1700 - 1800	2			4700-4800	REFUSAL		
1800 - 1900	3			4800-4900			
1900 - 2000	3			4900-5000			
2000 - 2100	4			5000-5100			
2100 - 2200	4			5100-5200			
2200 - 2300	4			5200-5300			
2300 - 2400	5			5300-5400			
2400 - 2500	6			5400-5500			
2500 - 2600	6			5500-5600			
2600 - 2700	6			5600-5700			
2700 - 2800	5			5700-5800			
2800 - 2900	5			5800-5900			
2900 - 3000	7			5900-6000			

Remarks:
1. The procedure used for this test is similar to that described in AS1289.6.3.2-1997, Method 6.3.2.
2. Usually 8 blows per 20mm is taken as refusal
3. Site datum is AHD.

NOTES

To be read in conjunction with text of report.
For explanation of mapping symbols see Figure 3.

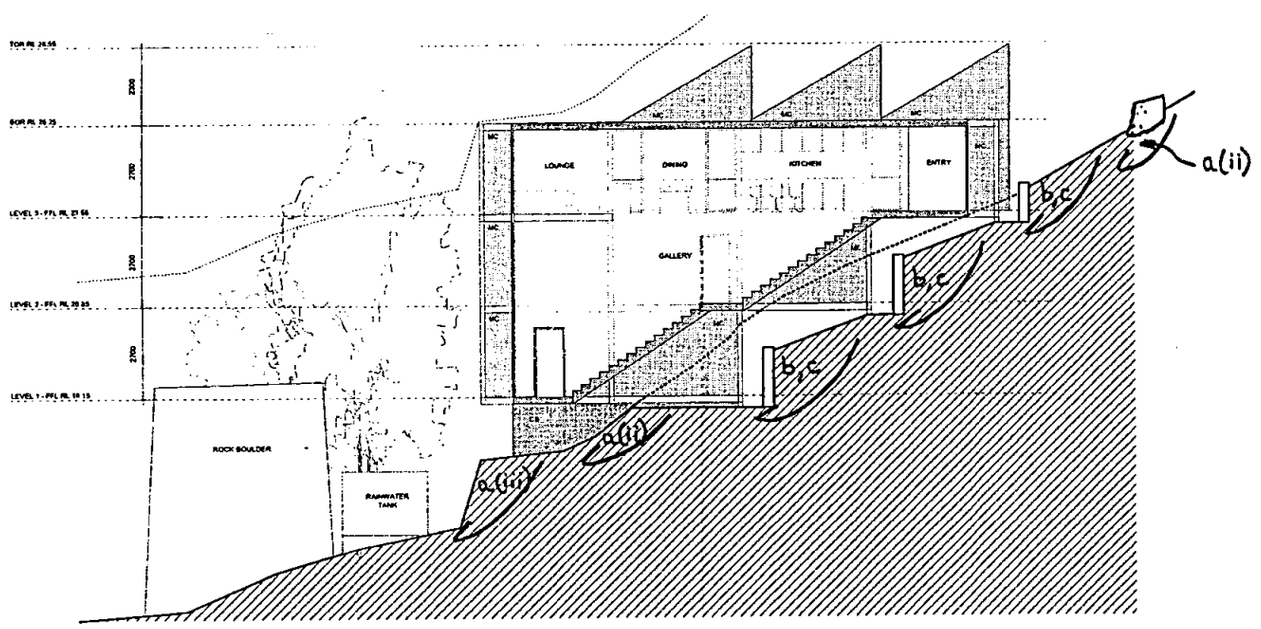


SCALE

0 20m

GEOTECHNICAL SITE PLAN

Jeffery & Katauskas Pty Ltd
Report No. 20992ZR Figure No. 1



SCALE 0 5m

CROSS SECTIONAL SKETCH A-A

Jeffery & Katauskas Pty Ltd

Report No. 20992ZR Figure No. 2

TOPOGRAPHY

Symbol *Ground Profile*

convex
concave
} well defined or angular break of slope

convex
concave
} poorly defined or smooth change of slope

breaks of slope
changes of slope
} convex and concave too close together to allow the use of separate symbols

sharp
rounded
} ridge crest

3 Cliff or escarpment or sharp break 40° or more (estimated height in metres)

15 Uniform Slope
10 Concave Slope
8 Convex Slope
} Slope direction and angle (Degrees)

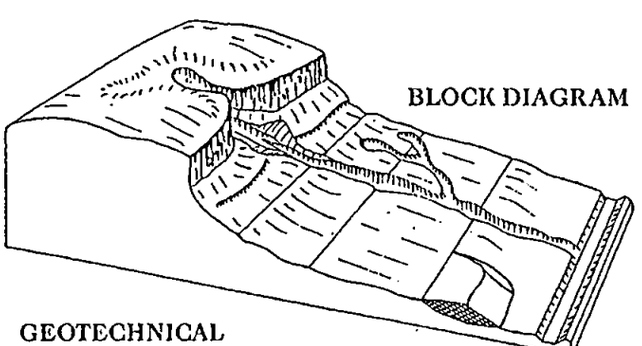
Top
Bottom
} Cut or fill slope, arrows pointing down slope

Hummocky or irregular ground

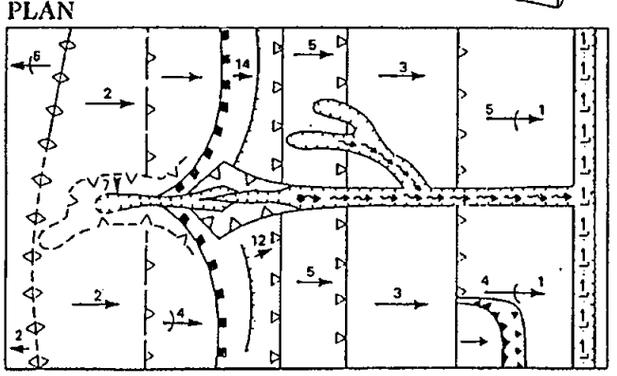
OTHER FEATURES

Boulder
Seepage/spring
Swallow hole for runoff
Natural water course
Open drain, unlined
Open drain, lined
Fenceline
Property boundary
Dry Stone Wall
J —— J 200 Major joint in rock face (opening in millimetres)
- T - T - 10 Tension crack (opening in millimetres)
Masonry or concrete wall
Ponding water
Boggy or swampy area

EXAMPLE OF USE OF TOPOGRAPHIC SYMBOLS:



GEOTECHNICAL PLAN



GEOTECHNICAL MAPPING SYMBOLS

Jeffery and Katauskas Pty Ltd
Report No. 20992ZR Figure No. 3

APPENDIX A

LANDSLIDE RISK MANAGEMENT TERMINOLOGY

APPENDIX A

LANDSLIDE RISK MANAGEMENT

DEFINITION OF TERMS

Risk – A measure of the probability and severity of an adverse effect to health, property or the environment.
Risk is often estimated by the product of probability x consequences. However, a more general interpretation of risk involves a comparison of the probability and consequences in a non-product form.

Hazard – A condition with the potential for causing an undesirable consequence (*the landslide*). The description of landslide hazard should include the location, volume (or area), classification and velocity of the potential landslides and any resultant detached material, and the likelihood of their occurrence within a given period of time.

Elements at Risk – Meaning the population, buildings and engineering works, economic activities, public services utilities, infrastructure and environmental features in the area potentially affected by landslides.

Probability – The likelihood of a specific outcome, measured by the ratio of specific outcomes to the total number of possible outcomes. Probability is expressed as a number between 0 and 1, with 0 indicating an impossible outcome, and 1 indicating that an outcome is certain.

Frequency – A measure of likelihood expressed as the number of occurrences of an event in a given time. See also Likelihood and Probability.

Likelihood – used as a qualitative description of probability or frequency.

Temporal Probability – The probability that the element at risk is in the area affected by the landsliding, at the time of the landslide.

Vulnerability – The degree of loss to a given element or set of elements within the area affected by the landslide hazard. It is expressed on a scale of 0 (no loss) to 1 (total loss). For property, the loss will be the value of the damage relative to the value of the property; for persons, it will be the probability that a particular life (the element at risk) will be lost, given the person(s) is affected by the landslide.

Consequence – The outcomes or potential outcomes arising from the occurrence of a landslide expressed qualitatively or quantitatively, in terms of loss, disadvantage or gain, damage, injury or loss of life.

Risk Analysis – The use of available information to estimate the risk to individuals or populations, property, or the environment, from hazards. Risk analyses generally contain the following steps: scope definition, hazard identification, and risk estimation.

This appendix is an extract from LANDSLIDE RISK MANAGEMENT CONCEPTS AND GUIDELINES as presented in Australian Geomechanics, Vol. 35, No.1, 2000 which discusses the matter more fully.

Risk Estimation – The process used to produce a measure of the level of health, property, or environmental risks being analysed. Risk estimation contains the following steps: frequency analysis, consequence analysis, and their integration.

Risk Evaluation – The stage at which values and judgements enter the decision process, explicitly or implicitly, by including consideration of the importance of the estimated risks and the associated social, environmental, and economic consequences, in order to identify a range of alternatives for managing the risks.

Risk Assessment – The process of risk analysis and risk evaluation.

Risk Control or Risk Treatment – The process of decision making for managing risk, and the implementation, or enforcement of risk mitigation measures and the re-evaluation of its effectiveness from time to time, using the results of risk assessment as one input.

Risk Management – The complete process of risk assessment and risk control (*or risk treatment*).

Individual Risk – The risk of fatality or injury to any identifiable (named) individual who lives within the zone impacted by the landslide; or who follows a particular pattern of life that might subject him or her to the consequences of the landslide.

Societal Risk – The risk of multiple fatalities or injuries in society as a whole: one where society would have to carry the burden of a landslide causing a number of deaths, injuries, financial, environmental, and other losses.

Acceptable Risk – A risk for which, for the purposes of life or work, we are prepared to accept as it is with no regard to its management. Society does not generally consider expenditure in further reducing such risks justifiable.

Tolerable Risk – A risk that society is willing to live with so as to secure certain net benefits in the confidence that it is being properly controlled, kept under review and further reduced as and when possible.

In some situations risk may be tolerated because the individuals at risk cannot afford to reduce risk even though they recognise it is not properly controlled.

Landslide Intensity – A set of spatially distributed parameters related to the destructive power of a landslide. The parameters may be described quantitatively or qualitatively and may include maximum movement velocity, total displacement, differential displacement, depth of the moving mass, peak discharge per unit width, kinetic energy per unit area.

Note: Reference should also be made to Figure A1 which shows the inter-relationship of many of these terms and the relevant portion of Landslide Risk Management.

Reference should also be made to the paper referenced below for Landslide Terminology and more detailed discussion of the above terminology.

TABLE A1: LANDSLIDE RISK ASSESSMENT QUALITATIVE TERMINOLOGY FOR USE IN ASSESSING RISK TO PROPERTY

Qualitative Measures of Likelihood

Level	Descriptor	Description	Indicative Annual Probability
A	ALMOST CERTAIN	The event is expected to occur.	$>\approx 10^{-1}$
B	LIKELY	The event will probably occur under adverse conditions.	$\approx 10^{-2}$
C	POSSIBLE	The event could occur under adverse conditions.	$\approx 10^{-3}$
D	UNLIKELY	The event might occur under very adverse circumstances.	$\approx 10^{-4}$
E	RARE	The event is conceivable but only under exceptional circumstances.	$\approx 10^{-5}$
F	NOT CREDIBLE	The event is inconceivable or fanciful.	$<10^{-6}$

Note: "≈" means that the indicative value may vary by say ±½ order of magnitude, or more.

Qualitative Measures of Consequences to Property

Level	Descriptor	Description
1	CATASTROPHIC	Structure completely destroyed or large scale damage requiring major engineering works for stabilisation.
2	MAJOR	Extensive damage to most of structure, or extending beyond site boundaries requiring significant stabilisation works.
3	MEDIUM	Moderate damage to some of structure, or significant part of site requiring large stabilisation works.
4	MINOR	Limited damage to part of structure, or part of site requiring some reinstatement/stabilisation works.
5	INSIGNIFICANT	Little damage.

Note: The "Description" may be edited to suit a particular case.

Qualitative Risk Analysis Matrix – Level of Risk to Property

LIKELIHOOD	CONSEQUENCES to PROPERTY				
	1: CATASTROPHIC	2: MAJOR	3: MEDIUM	4: MINOR	5: INSIGNIFICANT
A – ALMOST CERTAIN	VH	VH	H	H	M
B – LIKELY	VH	H	H	M	L-M
C – POSSIBLE	H	H	M	L-M	VL-L
D – UNLIKELY	M-H	M	L-M	VL-L	VL
E – RARE	M-L	L-M	VL-L	VL	VL
F – NOT CREDIBLE	VL	VL	VL	VL	VL

Risk Level Implications

Risk Level		Example Implications(1)
VH	VERY HIGH RISK	Extensive detailed investigation and research, planning and implementation of treatment options essential to reduce risk to acceptable levels; may be too expensive and not practical.
H	HIGH RISK	Detailed investigation, planning and implementation of treatment options required to reduce risk to acceptable levels.
M	MODERATE RISK	Tolerable provided treatment plan is implemented to maintain or reduce risks. May be accepted. May require investigation and planning of treatment options.
L	LOW RISK	Usually accepted. Treatment requirements and responsibility to be defined to maintain or reduce risk.
VL	VERY LOW RISK	Acceptable. Manage by normal slope maintenance procedures.

Note: (1) The implications for a particular situation are to be determined by all parties to the risk assessment; these are only given as a general guide.

(2) Judicious use of dual descriptors for Likelihood, Consequence and Risk to reflect the uncertainty of the estimate may be appropriate in some cases.

These tables are an extract from LANDSLIDE RISK MANAGEMENT CONCEPTS AND GUIDELINES as presented in *Australian Geomechanics*, Vol. 35, No. 1, 2000 which discusses the matter more fully.

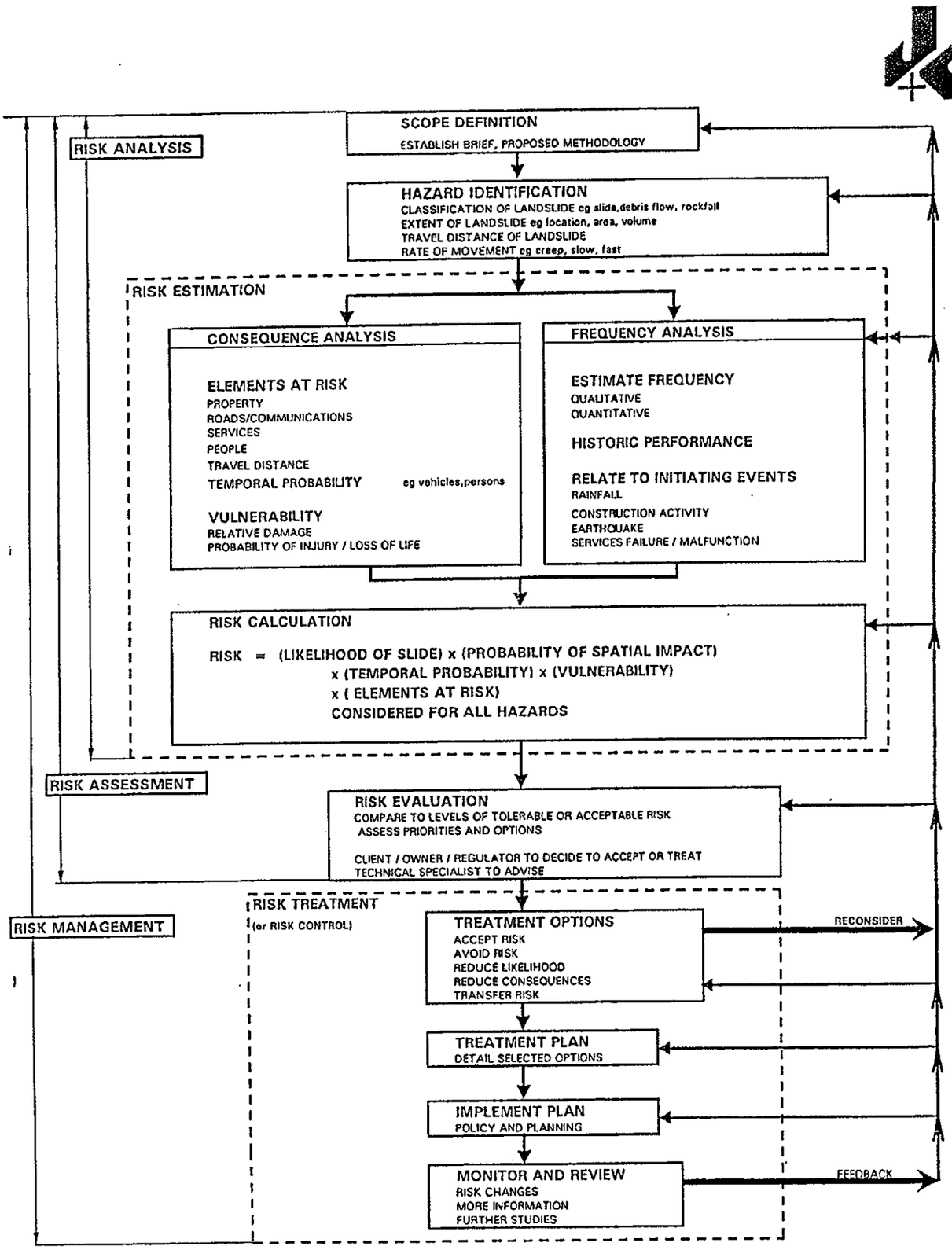


FIGURE A1: FLOWCHART FOR LANDSLIDE RISK MANAGEMENT

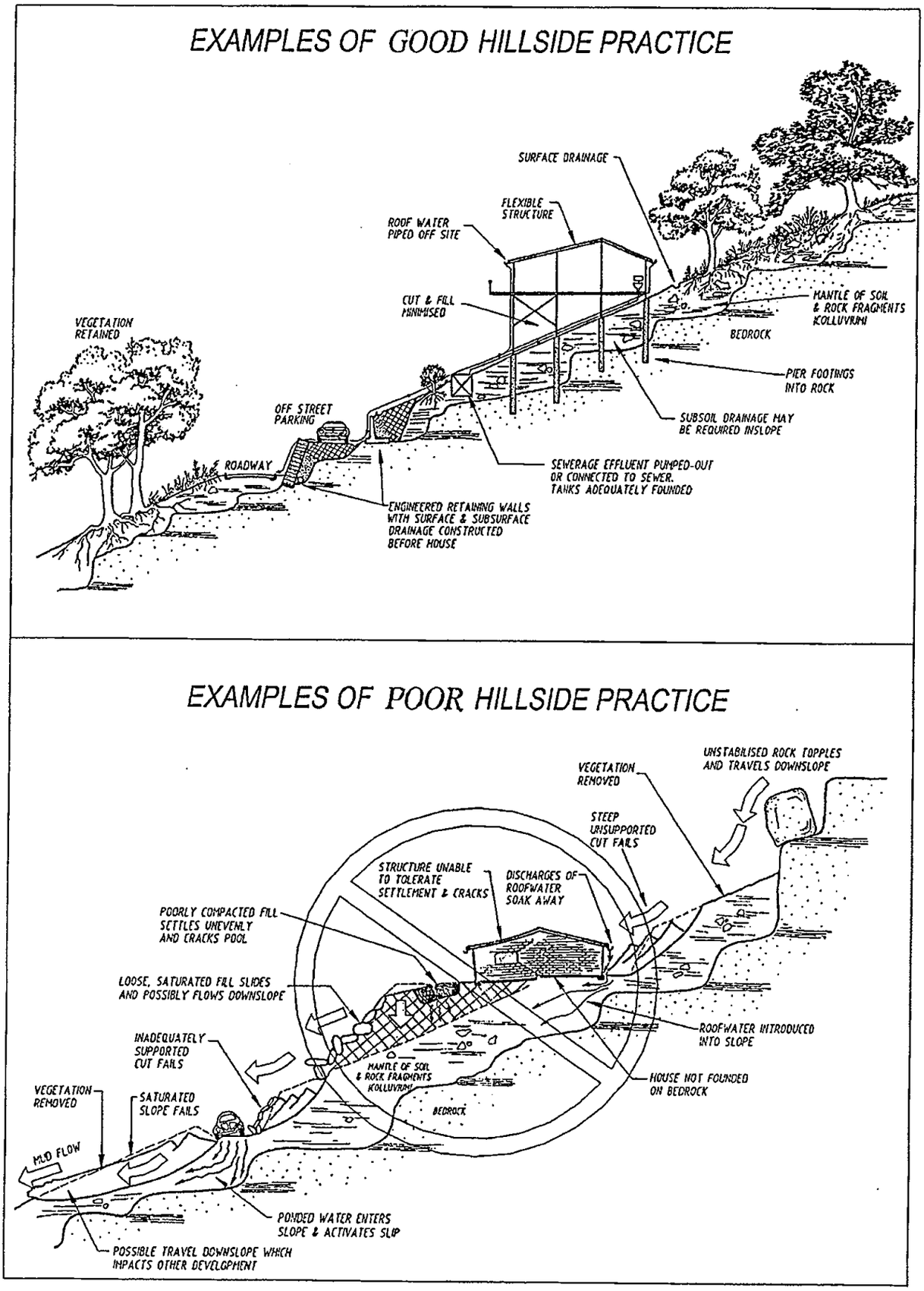
This figure is an extract from LANDSLIDE RISK MANAGEMENT CONCEPTS AND GUIDELINES as presented in Australian Geomechanics Vol35, No1, 2000 which discusses the matter more fully.

APPENDIX B

APPENDIX B – SOME GUIDELINES FOR HILLSIDE CONSTRUCTION

	GOOD ENGINEERING PRACTICE	POOR ENGINEERING PRACTICE
ADVICE		
GEOTECHNICAL ASSESSMENT	Obtain advice from a qualified, experienced geotechnical consultant at early stage of planning and before site works.	Prepare detailed plan and start site works before geotechnical advice.
PLANNING		
SITE PLANNING	Having obtained geotechnical advice, plan the development with the risk arising from the identified hazards and consequences in mind.	Plan development without regard for the Risk.
DESIGN AND CONSTRUCTION		
HOUSE DESIGN	Use flexible structures which incorporate properly designed brickwork, timber or steel frames, timber or panel cladding. Consider use of split levels. Use decks for recreational areas where appropriate.	Floor plans which require extensive cutting and filling. Movement intolerant structures.
SITE CLEARING	Retain natural vegetation wherever practicable.	Indiscriminately clear the site.
ACCESS & DRIVEWAYS	Satisfy requirements below for cuts, fills, retaining walls and drainage. Council specifications for grades may need to be modified. Driveways and parking areas may need to be fully supported on piers.	Excavate and fill for site access before geotechnical advice.
EARTHWORKS	Retain natural contours wherever possible.	Indiscriminant bulk earthworks.
CUTS	Minimise depth. Support with engineered retaining walls or batter to appropriate slope. Provide drainage measures and erosion control.	Large scale cuts and benching. Unsupported cuts. Ignore drainage requirements.
FILLS	Minimise height. Strip vegetation and topsoil and key into natural slopes prior to filling. Use clean fill materials and compact to engineering standards. Batter to appropriate slope or support with engineered retaining wall. Provide surface drainage and appropriate subsurface drainage.	Loose or poorly compacted fill, which if it fails, may flow a considerable distance (including onto properties below). Block natural drainage lines. Fill over existing vegetation and topsoil. Include stumps, trees, vegetation, topsoil, boulders, building rubble etc. in fill.
ROCK OUTCROPS & BOULDERS	Remove or stabilise boulders which may have unacceptable risk. Support rock faces where necessary.	Disturb or undercut detached blocks or boulders.
RETAINING WALLS	Engineer design to resist applied soil and water forces. Found on bedrock where practicable. Provide subsurface drainage within wall backfill and surface drainage on slope above. Construct wall as soon as possible after cut/fill operation.	Construct a structurally inadequate wall such as sandstone flagging, brick or unreinforced blockwork. Lack of subsurface drains and weepholes.
FOOTINGS	Found within bedrock where practicable. User rows of piers or strip footings oriented up and down slope. Design for lateral creep pressures if necessary. Backfill footing excavations to exclude ingress of surface water.	Found on topsoil, loose fill, detached boulders or undercut cliffs.
SWIMMING POOLS	Engineer designed. Support on piers to rock where practicable. Provide with under-drainage and gravity drain outlet where practicable. Design for high soil pressures which may develop on uphill side whilst there may be little or no lateral support on downhill side.	
DRAINAGE		
SURFACE	Provide at tops of cut and fill slopes. Discharge to street drainage or natural water courses. Provide generous falls to prevent blockage by siltation and incorporate silt traps. Line to minimise infiltration and make flexible where possible. Special structures to dissipate energy at changes of slope and/or direction.	Discharge at top of fills and cuts. Allow water to pond bench areas.
SUBSURFACE	Provide filter around subsurface drain. Provide drain behind retaining walls. Use flexible pipelines with access for maintenance. Prevent inflow of surface water.	Discharge of roof run-off into absorption trenches.
SEPTIC & SULLAGE	Usually requires pump-out or mains sewer systems; absorption trenches may be possible in some areas if risk is acceptable. Storage tanks should be water-tight and adequately founded.	Discharge sullage directly onto and into slopes. Use of absorption trenches without consideration of landslide risk.
EROSION CONTROL & LANDSCAPING	Control erosion as this may lead to instability. Revegetate cleared area.	Failure to observe earthworks and drainage recommendations when landscaping.
DRAWINGS AND SITE VISITS DURING CONSTRUCTION		
DRAWINGS	Building Application drawings should be viewed by a geotechnical consultant.	
SITE VISITS	Site visits by consultant may be appropriate during construction.	
INSPECTION AND MAINTENANCE BY OWNER		
OWNER'S RESPONSIBILITY	Clean drainage systems; repair broken joints in drains and leaks in supply pipes. Where structural distress is evident seek advice. If seepage observed, determine cause or seek advice on consequences.	

This table is an extract from LANDSLIDE RISK MANAGEMENT CONCEPTS AND GUIDELINES as presented in *Australian Geomechanics*, Vol 25, No 1, March 2000 which discusses the matter more fully.



APPENDIX B1 - ILLUSTRATIONS OF GOOD AND POOR HILLSIDE PRACTICE

This figure is an extract form LANDSLIDE RISK MANAGEMENT CONCEPTS AND GUIDELINES as presented in *Australian Geomechanics*, Vol 35, No 1, 2000 which discusses the matter more fully.

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS
ABN 17 003 550 801

REPORT EXPLANATION NOTES

INTRODUCTION

These notes have been provided to amplify the geotechnical report in regard to classification methods, field procedures and certain matters relating to the Comments and Recommendations section. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726, the SAA Site Investigation Code. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached Unified Soil Classification Table qualified by the grading of other particles present (eg sandy clay) as set out below:

Soil Classification	Particle Size
Clay	less than 0.002mm
Silt	0.002 to 0.06mm
Sand	0.06 to 2mm
Gravel	2 to 60mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose	less than 4
Loose	4 – 10
Medium dense	10 – 30
Dense	30 – 50
Very Dense	greater than 50

Cohesive soils are classified on the basis of strength (consistency) either by use of hand penetrometer, laboratory testing or engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength kPa
Very Soft	less than 25
Soft	25 – 50
Firm	50 – 100
Stiff	100 – 200
Very Stiff	200 – 400
Hard	Greater than 400
Friable	Strength not attainable – soil crumbles

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, "Shale" is used to describe thinly bedded to laminated siltstone.

SAMPLING

Sampling is carried out during drilling or from other excavations to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon the degree of disturbance, some information on strength and structure. Bulk samples are similar but of greater volume required for some test procedures.

Undisturbed samples are taken by pushing a thin-walled sample tube, usually 50mm diameter (known as a U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All except test pits, hand auger drilling and portable dynamic cone penetrometers require the use of a mechanical drilling rig which is commonly mounted on a truck chassis.

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for an excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Premature refusal of the hand augers can occur on a variety of materials such as hard clay, gravel or ironstone, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table. Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock fragments.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from "feel" and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term "mud" encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, an NMLC triple tube core barrel, which gives a core of about 50mm diameter, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS. The location of losses are determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the top end of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" – Test F3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as

  N = 13

  4, 6, 7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as

  N>30

  15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

Occasionally, the drop hammer is used to drive 50mm diameter thin walled sample tubes (U50) in clays. In such circumstances, the test results are shown on the borehole logs in brackets.

A modification to the SPT test is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as "N_c" on the borehole logs,

together with the number of blows per 150mm penetration.

Static Cone Penetrometer Testing and Interpretation: Cone penetrometer testing (sometimes referred to as a Dutch Cone) described in this report has been carried out using an Electronic Friction Cone Penetrometer (EFCP). The test is described in Australian Standard 1289, Test F5.1.

In the tests, a 35mm diameter rod with a conical tip is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the frictional resistance on a separate 134mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are electrically connected by wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20mm per second) the information is output as incremental digital records every 10mm. The results given in this report have been plotted from the digital data.

The information provided on the charts comprise:

- Cone resistance – the actual end bearing force divided by the cross sectional area of the cone – expressed in MPa.
- Sleeve friction – the frictional force on the sleeve divided by the surface area – expressed in kPa.
- Friction ratio – the ratio of sleeve friction to cone resistance, expressed as a percentage.

The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and occasionally very soft clays, rising to 4% to 10% in stiff clays and peats. Soil descriptions based on cone resistance and friction ratios are only inferred and must not be considered as exact.

Correlations between EFCP and SPT values can be developed for both sands and clays but may be site specific.

Interpretation of EFCP values can be made to empirically derive modulus or compressibility values to allow calculation of foundation settlements.

Stratification can be inferred from the cone and friction traces and from experience and information from nearby boreholes etc. Where shown, this information is presented for general guidance, but must be regarded as interpretive. The test method provides a continuous profile of engineering properties but, where precise information on soil classification is required, direct drilling and sampling may be preferable.

Portable Dynamic Cone Penetrometers: Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a rod into the ground with a sliding hammer and counting the blows for successive 100mm increments of penetration.

Two relatively similar tests are used:

- Cone penetrometer (commonly known as the Scala Penetrometer) – a 16mm rod with a 20mm diameter cone end is driven with a 9kg hammer dropping 510mm (AS1289, Test F3.2). The test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various Road Authorities.
- Perth sand penetrometer – a 16mm diameter flat ended rod is driven with a 9kg hammer, dropping 600mm (AS1289, Test F3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.

LOGS

The borehole or test pit logs presented herein are an engineering and/or geological interpretation of the sub-surface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment, but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The attached explanatory notes define the terms and symbols used in preparation of the logs.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than "straight line" variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems:

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole or "reverted" chemically if water observations are to be made.

More reliable measurements can be made by installing standpipes which are read after stabilising at intervals ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg bricks, steel etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably determine the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedure used are given on the individual report forms.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg a three storey building) the information and interpretation may not be relevant if the design proposal is changed (eg to a twenty storey building). If this happens, the company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions – the potential for this will be partially dependent on borehole spacing and sampling frequency as well as investigation technique.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of persons or contractors responding to commercial pressures.

If these occur, the company will be pleased to assist with investigation or advice to resolve any problems occurring.

SITE ANOMALIES

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed that at some later stage, well after the event.

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Tender Documents", published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Copyright in all documents (such as drawings, borehole or test pit logs, reports and specifications) provided by the Company shall remain the property of Jeffery and Katauskas Pty Ltd. Subject to the payment of all fees due, the Client alone shall have a licence to use the documents provided for the sole purpose of completing the project to which they relate. License to use the documents may be revoked without notice if the Client is in breach of any objection to make a payment to us.

REVIEW OF DESIGN

Where major civil or structural developments are proposed or where only a limited investigation has been completed or where the geotechnical conditions/ constraints are quite complex, it is prudent to have a joint design review which involves a senior geotechnical engineer.

SITE INSPECTION

The company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

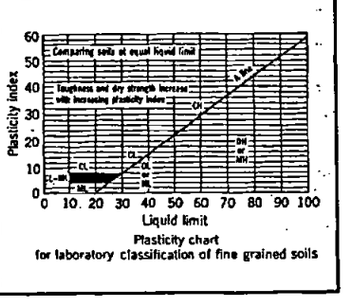
Requirements could range from:

i) a site visit to confirm that conditions exposed are no worse than those interpreted, to
ii) a visit to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, or
iii) full time engineering presence on site.

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

UNIFIED SOIL CLASSIFICATION TABLE

Field Identification Procedures (Excluding particles larger than 75 μm and basing fractions on estimated weights)						Group Symbols	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils: More than half of material is larger than 75 μm sieve size*	Gravels: More than half of coarse fraction is larger than 4 mm sieve size	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes			GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: *Silty sand*, gravelly; about 20% hard, angular gravel particles 12 mm maximum size; rounded and subangular sand grains coarse to fine, about 15% non-plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (*SM*)	Determine percentages of gravel and sand from grain size curve. Depending on percentage of fines (fraction smaller than 75 μm sieve size) coarse grained soils are classified as follows: Less than 5%: *GW, GP, SW, SP* More than 12%: *GM, GC, SM, SC* 5% to 12%: *Borderline* cases requiring use of dual symbols	$C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for *GW* Atterberg limits below "A" line, or *PI* less than 4 Atterberg limits above "A" line, with *PI* greater than 7 Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
		Gravels with fines (appreciable amount of fines)	Predominantly one size or a range of sizes with some intermediate sizes missing			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		
			Non-plastic fines (for identification procedures see *ML* below)			GM	Silty gravels, poorly graded gravel-sand-silt mixtures		
			Plastic fines (for identification procedures, see *CL* below)			GC	Clayey gravels, poorly graded gravel-sand-clay mixtures		
	Sands: More than half of coarse fraction is smaller than 4 mm sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes			SW	Well graded sands, gravelly sands, little or no fines		$C_U = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for *SW* Atterberg limits below "A" line or *PI* less than 5 Atterberg limits below "A" line with *PI* greater than 7 Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
		Sands with fines (appreciable amounts of fines)	Predominantly one size or a range of sizes with some intermediate sizes missing			SP	Poorly graded sands, gravelly sands, little or no fines		
			Non-plastic fines (for identification procedures, see *ML* below)			SM	Silty sands, poorly graded sand-silt mixtures		
			Plastic fines (for identification procedures, see *CL* below)			SC	Clayey sands, poorly graded sand-clay mixtures		
Fine-grained soils: More than half of material is smaller than 75 μm sieve size (The 75 μm sieve size is about the smallest particle visible to naked eye)	Identification Procedures on Fraction Smaller than 180 μm Sieve Size		Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)				Use grain size curve in identifying the fractions as given under field identification
	Silts and clays: liquid limit less than 50		None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; colour in wet condition, odour if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses For undisturbed soils add information on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions Example: *Clayey silt*, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (*ML*)	
			Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			Slight to medium	Slow	Slight	OL	Organic silts and organic silty clays of low plasticity		
	Silts and clays: liquid limit greater than 50		Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays		
			Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity		
Highly Organic Soils			Readily identified by colour, odour, spongy feel and frequently by fibrous texture			Pt	Peat and other highly organic soils		



Plasticity chart
for laboratory classification of fine grained soils

NOTE: 1) Soils possessing characteristics of two groups are designated by combinations of group symbols (e.g. GW-GC, well graded gravel-sand mixture with clay fines).

2) Soils with liquid limits of the order of 35 to 50 may be visually classified as being of medium plasticity.

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GRAPHIC LOG SYMBOLS FOR SOILS AND ROCKS

SOIL


FILL


TOPSOIL


CLAY (CL, CH)


SILT (ML, MH)


SAND (SP, SW)


GRAVEL (GP, GW)


SANDY CLAY (CL, CH)


SILTY CLAY (CL, CH)

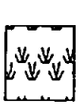

CLAYEY SAND (SC)


SILTY SAND (SM)


GRAVELLY CLAY (CL, CH)


CLAYEY GRAVEL (GC)


SANDY SILT (ML)


PEAT AND ORGANIC SOILS

ROCK


CONGLOMERATE


SANDSTONE


SHALE


SILTSTONE, MUDSTONE, CLAYSTONE


LIMESTONE


PHYLLITE, SCHIST


TUFF


GRANITE, GABBRO


DOLERITE, DIORITE


BASALT, ANDESITE


QUARTZITE

DEFECTS AND INCLUSIONS


CLAY SEAM


SHEARED OR CRUSHED SEAM


BRECCIATED OR SHATTERED SEAM/ZONE


IRONSTONE GRAVEL


ORGANIC MATERIAL

OTHER MATERIALS


CONCRETE


BITUMINOUS CONCRETE, COAL


COLLUVIUM

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A.B.N. 17 003 550 801 A.C.N. 003 550 801

LOG SYMBOLS

LOG COLUMN	SYMBOL	DEFINITION
Groundwater Record	▼	Standing water level. Time delay following completion of drilling may be shown.
	C	Extent of borehole collapse shortly after drilling.
	▶	Groundwater seepage into borehole or excavation noted during drilling or excavation.
Samples	ES	Soil sample taken over depth indicated, for environmental analysis.
	U50	Undisturbed 50mm diameter tube sample taken over depth indicated.
	DB	Bulk disturbed sample taken over depth indicated.
	DS	Small disturbed bag sample taken over depth indicated.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'R' as noted below.
	N_c = 5 7 3R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60 degree solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25	Vane shear reading in kPa of Undrained Shear Strength.
	PID = 100	Photoionisation detector reading in ppm (Soil sample headspace test).
Moisture Condition (Cohesive Soils)	MC>PL	Moisture content estimated to be greater than plastic limit.
	MC≈PL	Moisture content estimated to be approximately equal to plastic limit.
	MC<PL	Moisture content estimated to be less than plastic limit.
(Cohesionless Soils)	D	DRY - runs freely through fingers.
	M	MOIST - does not run freely but no free water visible on soil surface.
	W	WET - free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS	VERY SOFT - Unconfined compressive strength less than 25kPa
	S	SOFT - Unconfined compressive strength 25-50kPa
	F	FIRM - Unconfined compressive strength 50-100kPa
	St	STIFF - Unconfined compressive strength 100-200kPa
	VSt	VERY STIFF - Unconfined compressive strength 200-400kPa
	H	HARD - Unconfined compressive strength greater than 400kPa
	( )	Bracketed symbol indicates estimated consistency based on tactile examination or other tests.
Density Index/ Relative Density (Cohesionless Soils)		Density Index (Ib) Range (%) / SPT 'N' Value Range (Blows/300mm)
	VL	Very Loose < 15 0-4
	L	Loose 15-35 4-10
	MD	Medium Dense 35-65 10-30
	D	Dense 65-85 30-50
	VD	Very Dense > 85 > 50
	( )	Bracketed symbol indicates estimated density based on ease of drilling or other tests.
Hand Penetrometer Readings	300 250	Numbers indicate individual test results in kPa on representative undisturbed material unless noted otherwise.
Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Tungsten carbide wing bit.
	T 60	Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.

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CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

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LOG SYMBOLS

ROCK MATERIAL WEATHERING CLASSIFICATION

TERM	SYMBOL	DEFINITION
Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely weathered rock	XW	Rock is weathered to such an extent that it has "soil" properties, ie it either disintegrates or can be remoulded, in water.
Distinctly weathered rock	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by ironstaining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Slightly weathered rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh rock	FR	Rock shows no sign of decomposition or staining.

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Journal of Rock Mechanics, Mining, Science and Geomechanics. Abstract Volume 22, No 2, 1985.

TERM	SYMBOL	Is (50) MPa	FIELD GUIDE
Extremely Low:	EL	0.03	Easily remoulded by hand to a material with soil properties.
Very Low:	VL	0.1	May be crumbled in the hand. Sandstone is "sugary" and friable.
Low:	L	0.3	A piece of core 150mm long x 50mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.
Medium Strength:	M	1	A piece of core 150mm long x 50mm dia. can be broken by hand with difficulty. Readily scored with knife.
High:	H	3	A piece of core 150mm long x 50mm dia. core cannot be broken by hand, can be slightly scratched or scored with knife; rock rings under hammer.
Very High:	VH	10	A piece of core 150mm long x 50mm dia. may be broken with hand-held pick after more than one blow. Cannot be scratched with pen knife; rock rings under hammer.
Extremely High:	EH		A piece of core 150mm long x 50mm dia. is very difficult to break with hand-held hammer. Rings when struck with a hammer.

ABBREVIATIONS USED IN DEFECT DESCRIPTION

ABBREVIATION	DESCRIPTION	NOTES
Be	Bedding Plane Parting	Defect orientations measured relative to the normal to the long core axis (ie relative to horizontal for vertical holes)
CS	Clay Seam	
J	Joint	
P	Planar	
Un	Undulating	
S	Smooth	
R	Rough	
IS	Ironstained	
XWS	Extremely Weathered Seam	
Cr	Crushed Seam	
60t	Thickness of defect in millimetres	

Levy Online Payment Receipt

LONG SERVI
CORPORAT

Thank you for using our Levy Online payment system. Your payment for this building ap processed.

Applicant Name:	BRIAN WHEALING
Levy Application Reference:	5036186
Application Type:	DA
Application No.:	N0352/07
Local Government Area/Government Authority:	PITTWATER COUNCIL
Site Address:	100A
	WAKEHURST PARKWAY
	ELANORA HEIGHTS
	NSW
	2101
Value Of Work:	$450,000
Levy Due:	$1,575
Levy Payment:	$1,575
Online Payment Ref.:	675190509
Payment Date:	15/11/2012 10:34:22 PM

Form 11

Construction Certificate /PCA Appointment

made under the *Environmental Planning and Assessment Act 1979*
Sections 109C (1) (b), 81A (2) and 81A (4)
To Darren Ball of D.M Ball & Associates Pty Ltd

Application

Applicant
name
address
contact no (telephone/fax)

Brian Wheeling
51A Parkes St. Manly Vale 2093
0416 271 291

signature

Owner
name
address
contact no (telephone/fax)

Brian & Katherine Wheeling
51A Parkes St Manly Vale 2093
0416 271 291

Consent Of All Owner(s)

I/we consent to this application

signature
date

B. Wheeling K. Wheeling
1/12

Land To Be Developed
address

lot no, DP/MPS, etc vol/fol

area of site (m^2)

Lot 2, DP 1177671 Wakehurst Parkway
Elanora Heights
1299 m^2

Description of Development
type

- [x] Building Work
- [ ] Subdivision Work

description (eg. dwelling house)

proposed use

New Dwelling
To Live in

Value Of Work

$450,000.00

Builder/Owner Builder
(if known)
to be completed in the case of proposed residential building work
name
contractor licence no/permit no in case of owner builder

owner builder
Permit No 397142P

Date Of Receipt
(Office Use Only)

23/11/12

DRAWING SHEET LIST

A-000-001	Title Sheet
A-100-001	Site Plan
A-110-000	Garage & Entrance Gate
A-110-001	GA Level 1
A-110-002	GA Level 2
A-110-003	GA Level 3
A-110-004	GA Roof
A-111-000	Garage & Entrance Gate
A-111-001	Level 1
A-111-002	Level 2
A-111-003	Level 3
A-210-001	North & South Elevation
A-210-002	East Elevation
A-210-003	West Elevation
A-210-004	Garage
A-310-001	Longitudinal Section 1
A-310-002	Longitudinal Section 2
A-310-003	Longitudinal Section 3
A-310-004	Cross Section 1
A-310-005	Cross Section 2
A-520-001	Wall Panel Details Plan
A-520-002	Wall Panel Details
A-520-004	Roof Details
A-520-005	Jack Rafter Section
A-520-006	Box Gutter Details
A-520-007	Staircase Roof Section
A-520-008	Staircase Facade
A-541-001	Door Details
A-542-001	Window Details
A-546-001	Balustrade Detail Deck
A-546-002	Balustrade Detail Front
A-570-001	External Staircase North

DA REQUIREMENTS

GLAZING

All external glazing to have a maximum reflectivity index of 25%

Bushfire Specification - L1 Construction

BASIX REQUIREMENTS

WATER COMMITMENTS

FIXTURES
The applicant must install In the development:
• taps with a minimum rating of 6 star in the kitchen;

The applicant must install in the development:
• showerheads with a minimum rating of 3 star in all showers;
• a toilet flushing system with a minimum rating of 4 star in each toilet;
• basin taps with a minimum rating of 6 star in each bathroom;

ALTERNATIVE WATER
The applicant must configure the rainwater tank to collect rain runoff from at least 75 square metres of the roof area of the development.
The applicant must connect the rainwater tank to:
• all toilets in the development
• the cold water tap that supplies each clothes washer in the development
• at least one outdoor tap in the development

LANDSCAPE
The applicant must plant indigenous or low water use species of vegetation throughout 30 square metres of the site.

THERMAL COMFORT COMMITMENTS

FLOORS, WALLS, CEILINGS & ROOF

The applicant must construct the floor(s), walls, and ceiling/roof of the dwelling in accordance with the specifications listed in the table below.

floor - suspended floor above enclosed subfloor, framed
0.6 (or 1.3 including construction) (down)
site slope > 10% below floor

external wall - framed (weatherboard, fibro, metal clad)
1.30 (or 1.70 including construction)

ceiling and roof - raked ceiling / pitched or skillion roof, framed
ceiling: 2.24 (up), roof: foil backed blanket (55mm)
framed; medium (solar absorptance 0.475-0.70)

ceiling and roof - flat ceiling / flat roof, framed
ceiling: 2.08 (up), roof: foil backed blanket (55mm)
framed; medium (solar absorptance 0.475-0.70)

WINDOWS CLAZED DOORS & SKYLIGHTS

The applicant must install the windows, glazed doors and shading devices described in the table below, in accordance with the specifications listed in the table. Relevant overshadowing specifications must be satisfied for each window and glazed door.
The dwelling may have 1 skylight (<0.7 square metres) and up to 2 windows/ glazed doors (<0.7 square metres) which are not listed in the table.
The following requirements must also be satisfied in relation to each window and glazed door:
• Except where the glass is 'single clear' or 'single toned', each window and glazed door must have a U-value no greater than that listed and a Solar Heat Gain Coefficient (SHGC) +/-10% of that listed. Total system U-values and SHGC must be calculated in accordance with National Fenestration Rating Council (NFRC) conditions.
• The leading edge of each eave, pergola, verandah, balcony or awning must be no more than 500 millimetres above the head of the window or glazed door, except that a projection greater than 500 mm and up to 1500 mm above the head must be twice the value in the table.
• Pergolas with polycarbonate roof or similar translucent material must have a shading coefficient of less than 0.35.
• Unless they have adjustable shading, pergolas must have fixed battens parallel to the window or glazed door above which they are situated, unless the pergola also shades a perpendicular window. The spacing between battens must not be more than 50 mm
• Overshadowing buildings/vegetation must be of the height and distance from the centre and the base of the window and glazed door, as specified in the 'overshadowing' column.

CROSS VENTILATION
The commitment below applies to the following rooms or areas of a dwelling which comprise a breeze path for the dwelling:
• Breeze path 1: within main living area
• Breeze path 2: within Bedroom 1 (not ensuite)
• Breeze path 3: Bedroom 2 to other space (not separate bathroom)
• Breeze path 4: Bedroom 3 to other space (not separate bathroom)
The applicant must construct the dwelling so that at least 1 ventilation opening is provided in each such room or area.
(If only 1 room or area of a dwelling is mentioned for a breeze path, then that room or area must have at least 2 ventilation openings).

The 2 ventilation openings must be located as follows:
• Breeze path 1: opposite external walls
• Breeze path 2: >3 m apart and on adjacent external walls
• Breeze path 3: >3 m apart and on adjacent external walls
• Breeze path 4: >3 m apart and on adjacent external walls

The 2 ventilation openings must meet the following specifications: (a) not be more than 15 metres apart; (b) be at least 1 square metre in size; and (c) have only 1 doorway, or opening less than 2 square metres in size, located in the direct path between them.

ENERGY COMMITMENTS

HOT WATER
The applicant must install the following hot water system in the development, or a system with a higher energy rating, or a system with a higher energy rating: gas instantaneous - 5 Star

COOLING SYSTEM
The living areas must not incorporate any cooling system, or any ducting which is designed to accommodate a cooling system.
The bedrooms must not incorporate any cooling system, or any ducting which is designed to accommodate a cooling system.

HEATING SYSTEM
The living areas must not incorporate any heating system, or any ducting which is designed to accommodate a heating system.
The bedrooms must not incorporate any heating system, or any ducting which is designed to accommodate a heating system.

VENTILATION
The applicant must install the following exhaust systems in the development:
At least 1 Bathroom: no mechanical ventilation (ie. natural);
Operation control: n/a
Kitchen: individual fan, ducted to façade or roof;
Operation
control: manual switch on/off
Laundry: natural ventilation only, or no laundry;
Operation control: n/a

ARTIFICIAL LIGHTING
The applicant must ensure that the "primary type of artificial lighting" is fluorescent or light emitting diode (LED) lighting in each of the following rooms, and where the word "dedicated" appears, the fittings for those lights must only be capable of accepting fluorescent or light emitting diode (LED) lamps:
• at least 3 of the bedrooms / study;
• at least 1 of the living / dining rooms;

NATURAL LIGHTING
The applicant must install:
• a window and/or skylight in the kitchen of the dwelling for natural lighting.
• a window and/or skylight in 3 bathroom(s)/toilet(s) in the development for natural lighting.

OTHER
The applicant must install:
• a gas cooktop & electric oven in the kitchen of the dwelling.
• a fixed outdoor clothes drying line as part of the development.
• a fixed indoor or sheltered clothes drying line as part of the development.

Window/glazed door no.	Orientation	Maximum area (square metres)	Type	Shading	Overshadowing
W1	N	4.2	timber or uPVC, single toned (or U-value:5.67, SHGC:0.49)	eave/verandah/pergola/balcony 601-750 mm	not overshadowed
W2	N	12.6	timber or uPVC, single clear (or U-value:5.71, SHGC:0.66)	eave/verandah/pergola/balcony 601-750 mm	2-4m high, 2-5 m away
W3	N	10.56	timber or uPVC, toned/air gap/clear (U-value:3.64, SHGC:0.42)	eave/verandah/pergola/balcony 601-750 mm	not overshadowed
W4	S	31.68	timber or uPVC, clear/air gap/clear (U-value:3.67, SHGC:0.59)	none	not overshadowed
W5	E	6.5	timber or uPVC, clear/air gap/clear (U-value:3.67, SHGC:0.59)	eave/verandah/pergola/balcony 751-900 mm	not overshadowed
W6	W	17.28	timber or uPVC, toned/air gap/clear (U-value:3.64, SHGC:0.42)	eave/verandah/pergola/balcony 751-900 mm	not overshadowed
W7	S	7.38	timber or uPVC, clear/air gap/clear (U-value:3.67, SHGC:0.59)	none	not overshadowed
W8	N	2.46	timber or uPVC, single clear (or U-value:5.71, SHGC:0.66)	eave/verandah/pergola/balcony 601-750 mm	not overshadowed
W9	N	4.2	timber or uPVC, single toned (or U-value:5.67, SHGC:0.49)	eave/verandah/pergola/balcony 601-750 mm	not overshadowed
W10	N	12.6	timber or uPVC, single clear (or U-value:5.71, SHGC:0.66)	eave/verandah/pergola/balcony 601-750 mm	2-4m high, 2-5 m away

Notes

DO NOT SCALE OFF DRAWINGS

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Builder to verify all Dimensions onsite before commencing work. Work to figured Dimensions only.

CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No 214/12
Approval Date: 7/12/12
Certifier: D. Ball Accr. No. BPB0019
Signature:
D.M. BALL & ASSOCIATES PTY LTD

Rev. Date Description

MFArchitecture
ABN 19 665 321 421

PO Box 417
MANLY NSW 1655

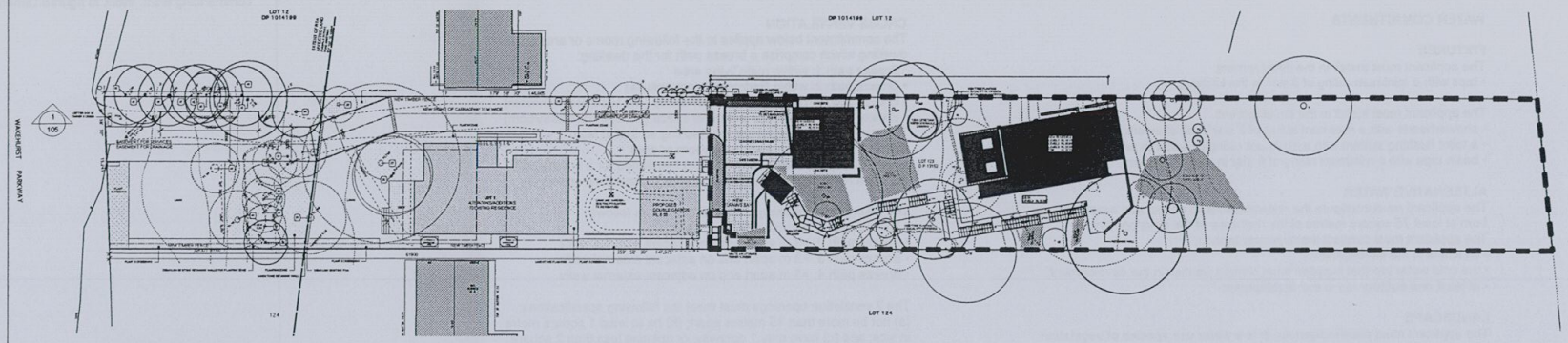
mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

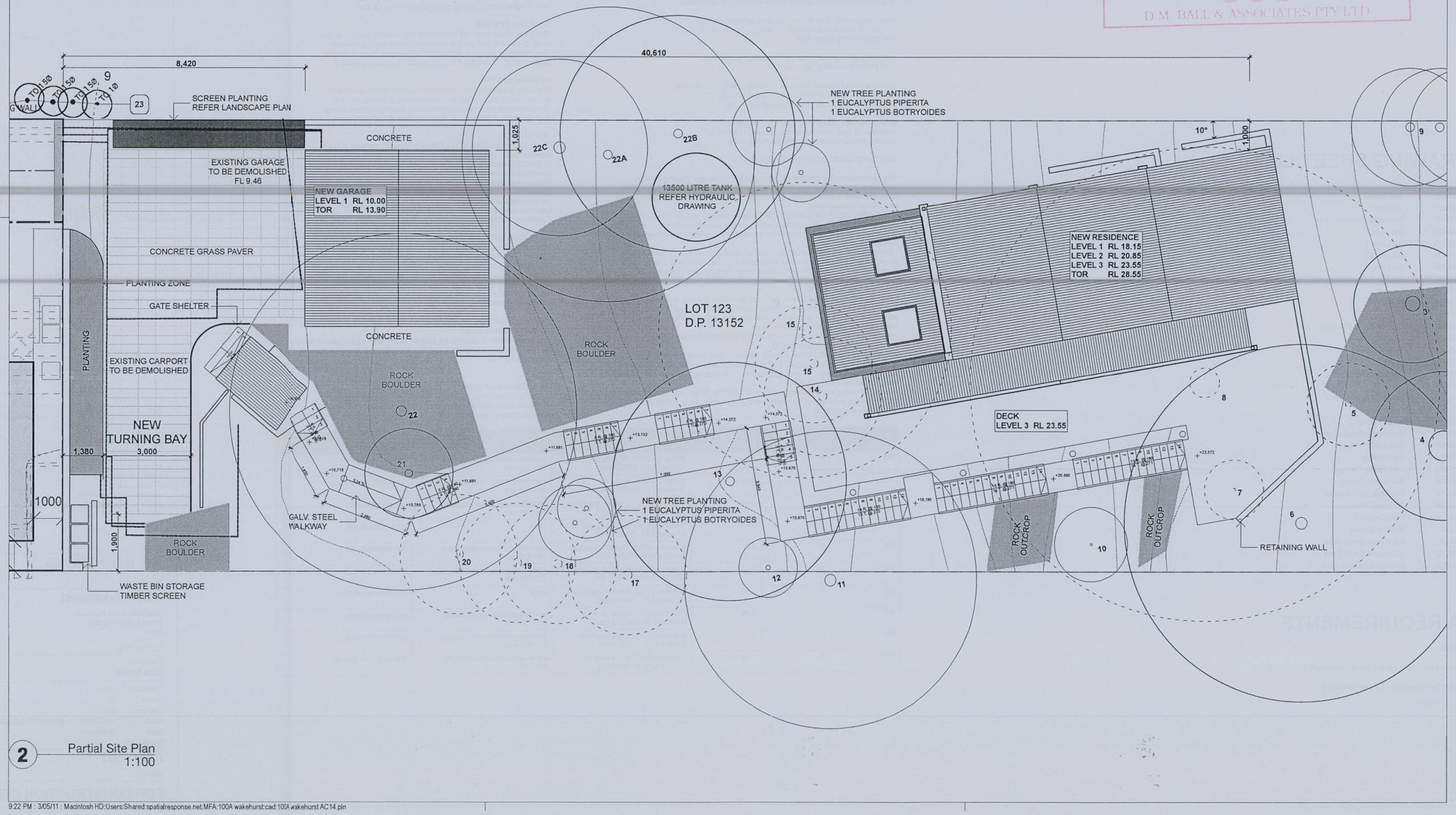
Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
General
Title Sheet

Project No	10008
Drawn	DS
Checked	MF
Scale	1:1, 1:1.25 @ SHEET SIZE A2
Date	29/04/2011
Drawing No	A-000-001
Phase	FOR CONSTRUCTION CERT.



1 Overall Site Plan
1:500



2 Partial Site Plan
1:100

9:22 PM : 3/05/11 : Macintosh HD:Users:Shared:spatialresponse.net:MFA:100A wakehurst:cad:100A wakehurst AC14.pln

CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No. 214/12
Approval Date: 7/12/12
Certifier: D. Ball Accr. No. BPB0019
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Notes

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CONTOURS INTERPOLATED FROM SURVEY OF LOT 123 IN D.P. 13152 BY: DP SURVEYING SERVICES, DATED 14. AUGUST 2006.

REFER TO SURVEY FOR SPOT LEVELS.

Rev.	Date	Description

MFArchitecture
ABN 19 665 321 421

PO Box 417
MANLY NSW 1655

mobile: 0434 904 582
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Client
MR. B. WHEALING

Project
100A Wakehurst

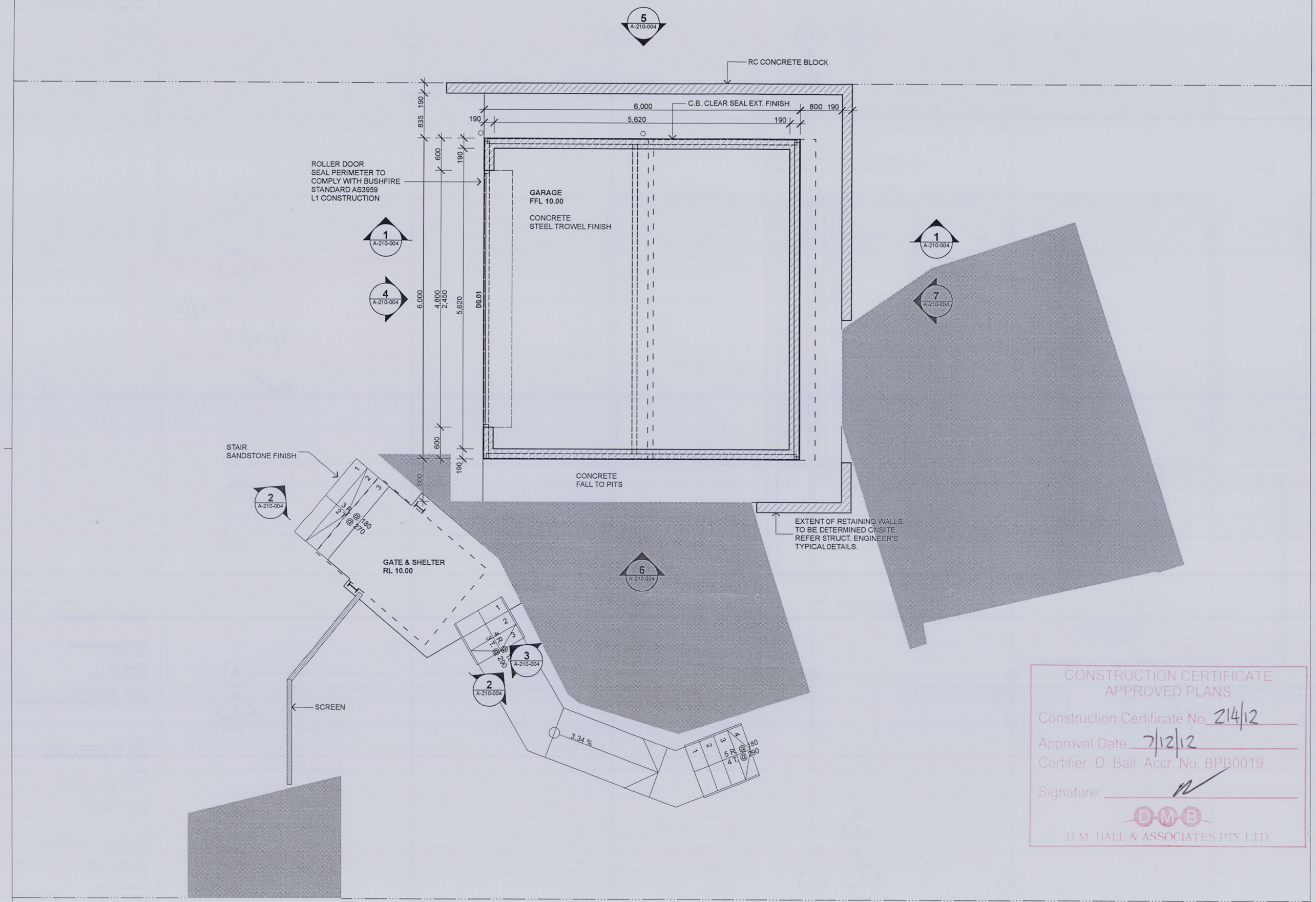
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
Plans
Site Plan

Project No	10008
Drawn	DS
Checked	MF
Scale	1:500, 1:100 @ SHEET SIZE A2
Date	29/04/2011
Drawing No	

A-100-001

Phase
FOR CONSTRUCTION CERT.



1 Garage & Entrance
1:50

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Notes

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APPROVED PLANS
Construction Certificate No. 214/12
Approval Date: 7/12/12
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Rev. Date Description

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ABN 19 665 321 421
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Client
MR. B. WHEALING

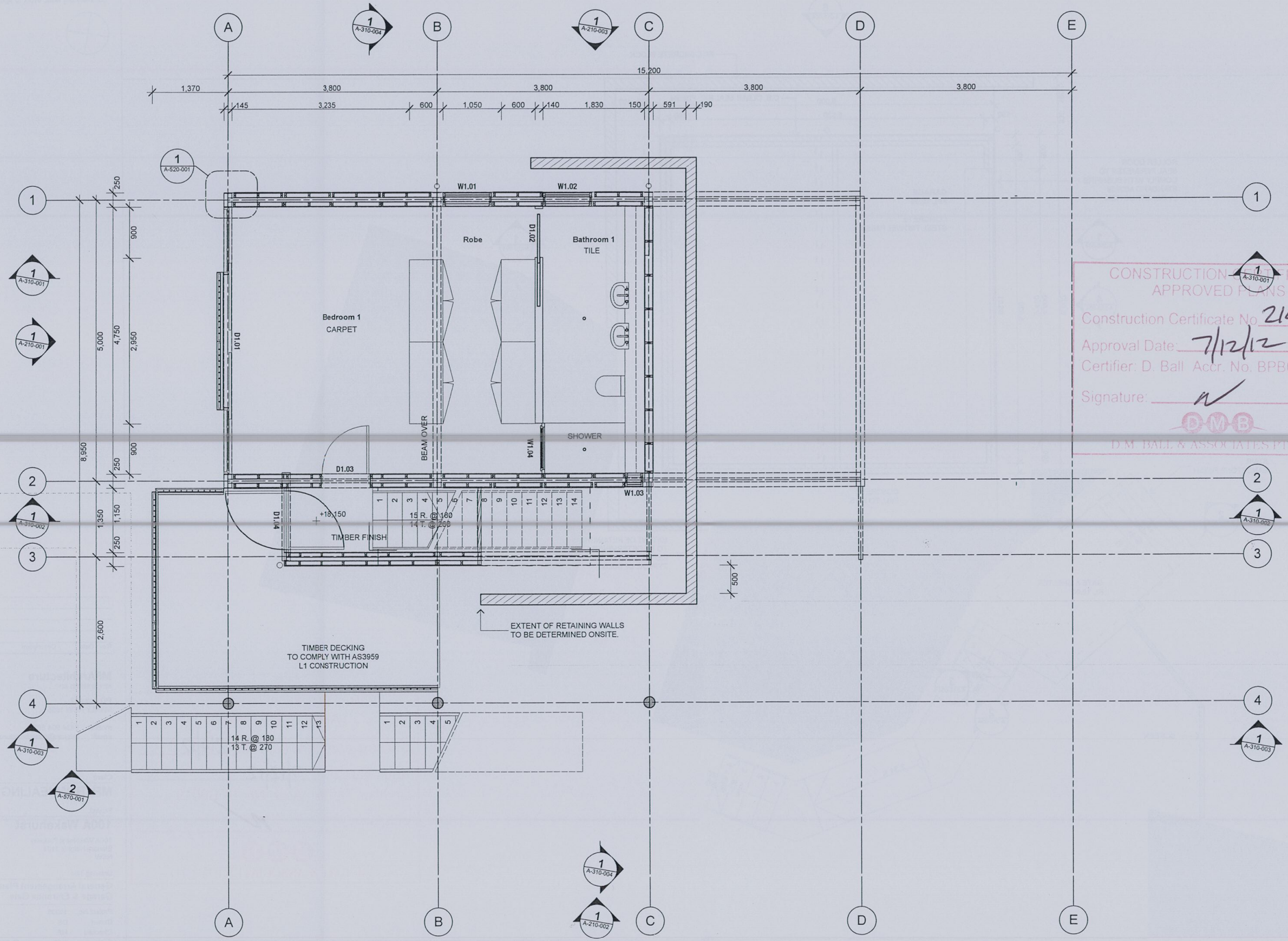
Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
General Arrangement Plan
Garage & Entrance Gate

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:50	@ SHEET SIZE A2
Date	29/04/2011	

Drawing No
A-110-000

Phase
FOR CONSTRUCTION CERT.



1 LEVEL 1
1:50

CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No. 214/12
Approval Date: 7/12/12
Certifier: D. Ball Accr. No. BPB0019
Signature:
D.M. BALL & ASSOCIATES PTY LTD

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Client
MR. B. WHEALING

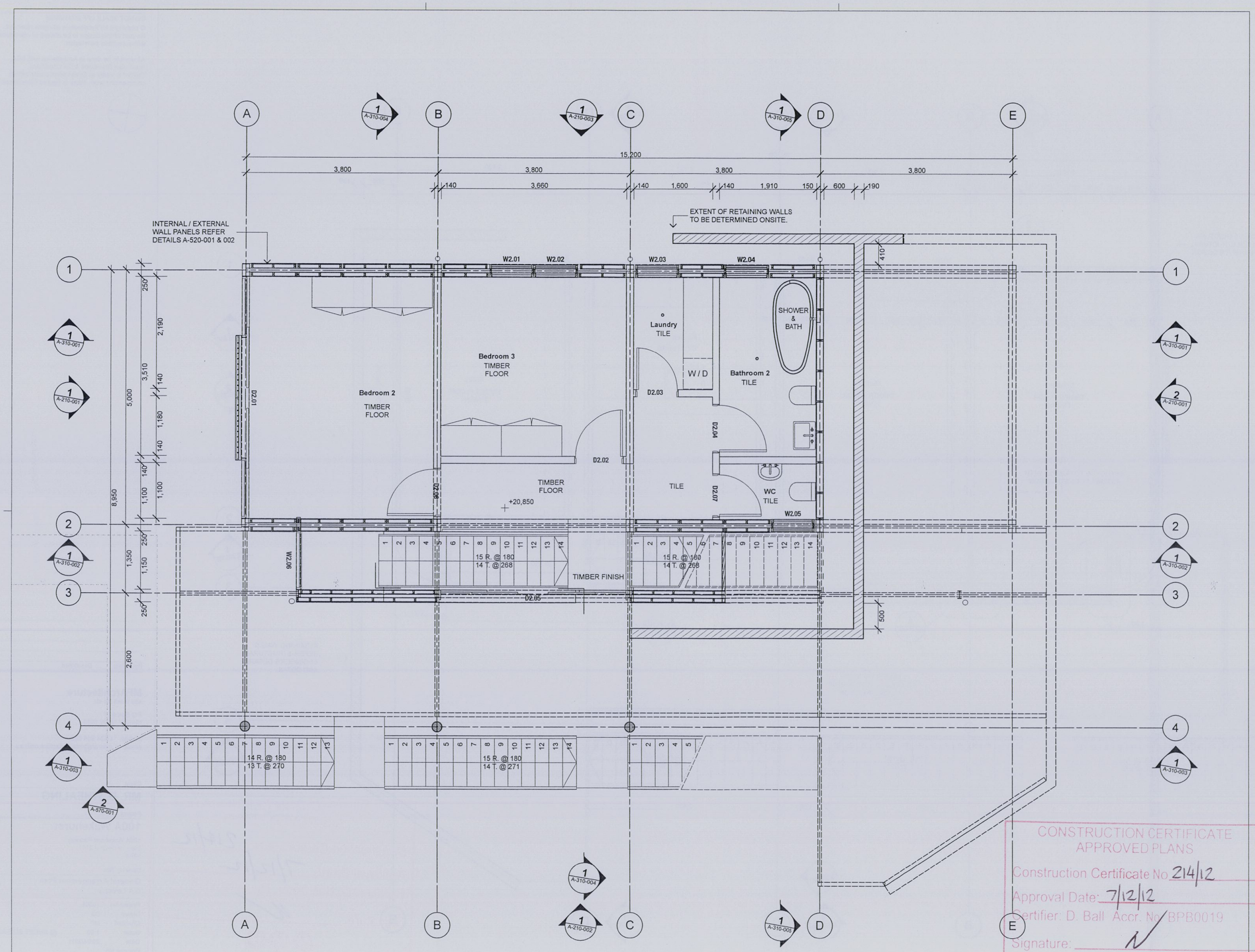
Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
General Arrangement Plan
GA Level 1

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:50	@ SHEET SIZE A2
Date	29/04/2011	

Drawing No
A-110-001

Phase
FOR CONSTRUCTION CERT.



LEVEL 2
1:50

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Notes

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Client
MR. B. WHEALING

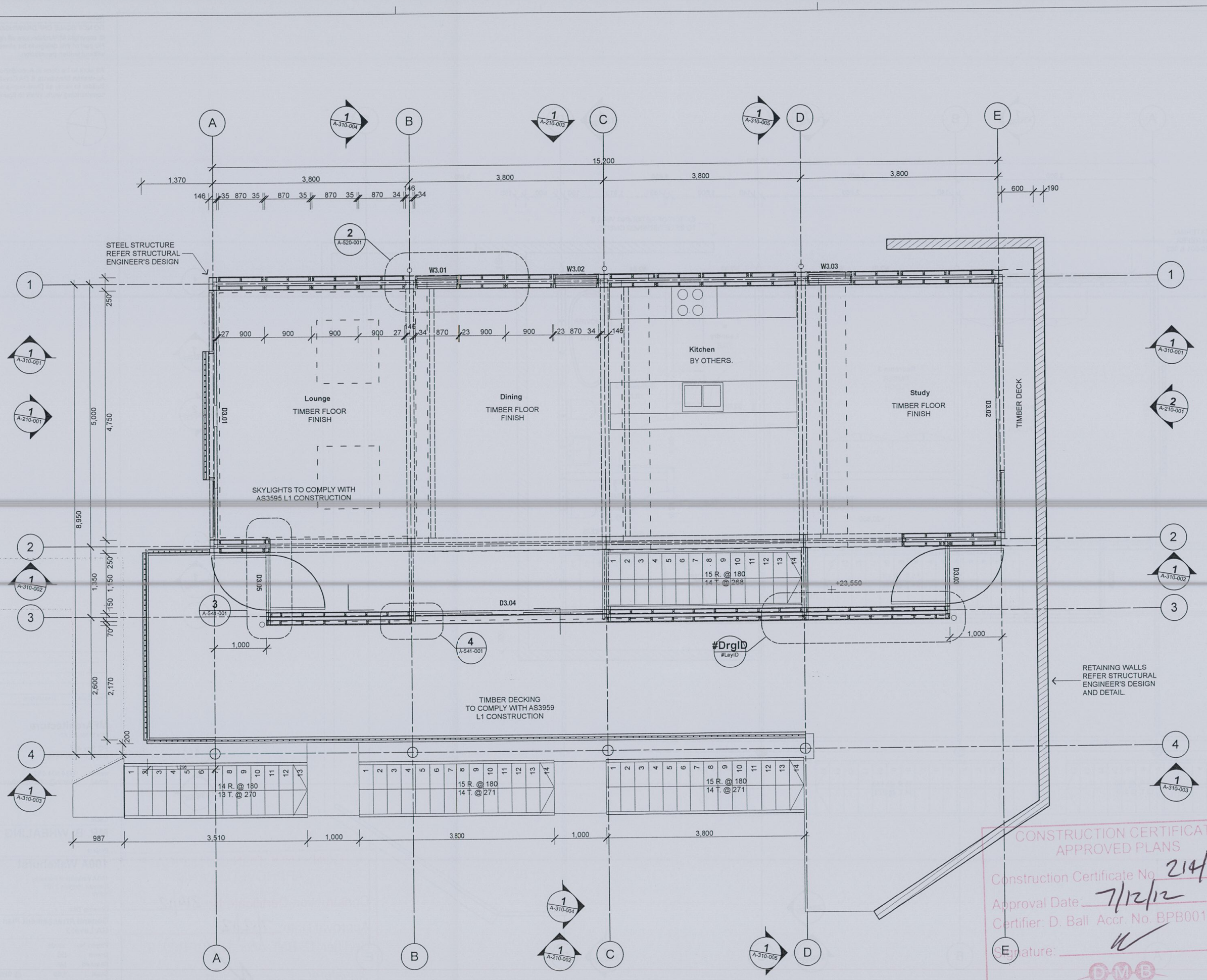
Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
General Arrangement Plan
GA Level 2

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:50	@ SHEET SIZE A2
Date	29/04/2011	

Drawing No
A-110-002

Phase
FOR CONSTRUCTION CERT.



1 LEVEL 3
1:50

CONSTRUCTION CERTIFICATE
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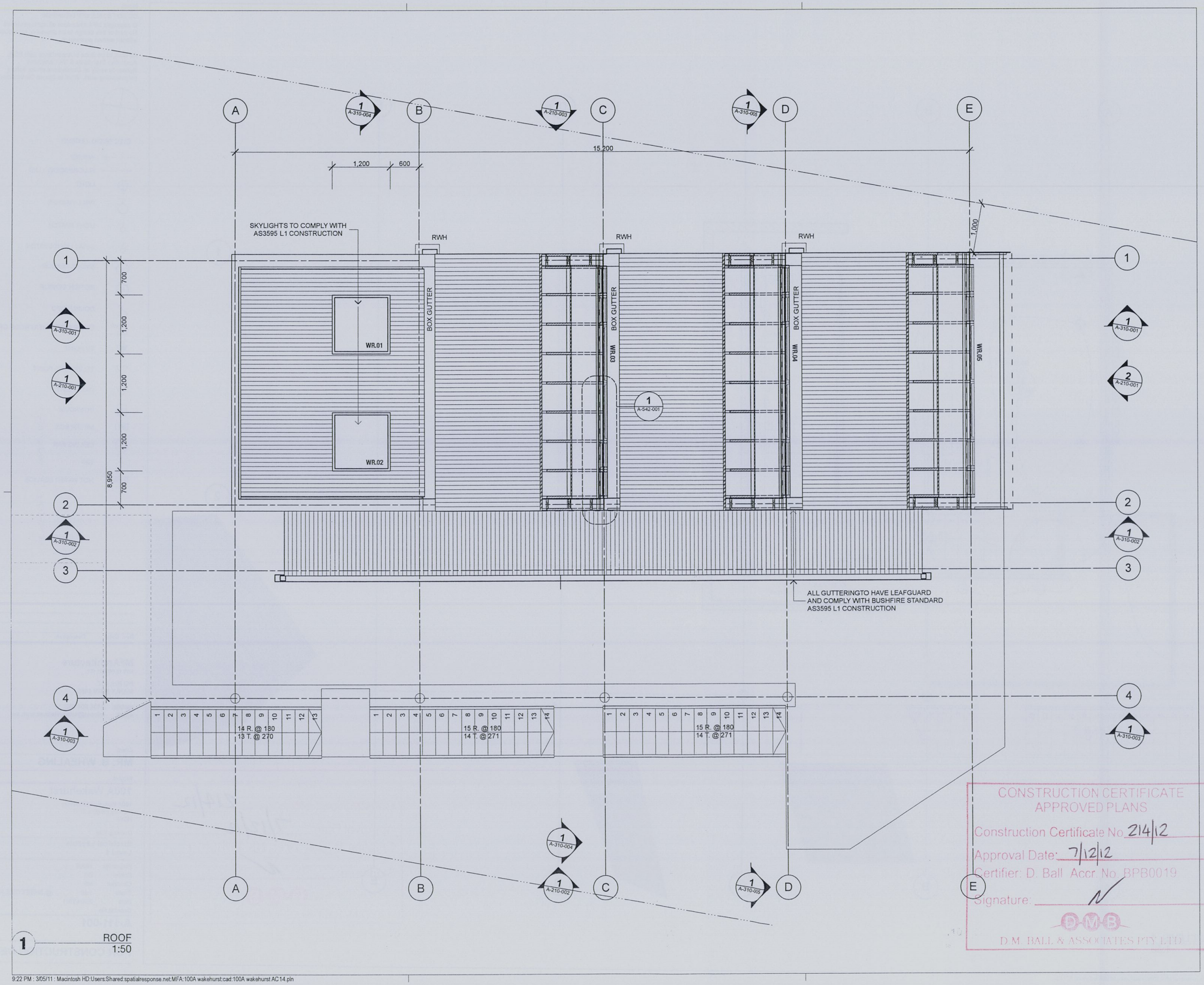
Client
MR. B. WHEALING

Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
General Arrangement Plan
GA Level 3

Project No	10008
Drawn	DS
Checked	MF
Scale	1:50 @ SHEET SIZE A2
Date	29/04/2011
Drawing No	A-110-003
Phase	FOR CONSTRUCTION CERT.



1 ROOF
1:50

CONSTRUCTION CERTIFICATE
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Client
MR. B. WHEALING

Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
General Arrangement Plan
GA Roof

Project No	10008
Drawn	DS
Checked	MF
Scale	1:50 @ SHEET SIZE A2
Date	29/04/2011
Drawing No	A-110-004
Phase	FOR CONSTRUCTION CERT.

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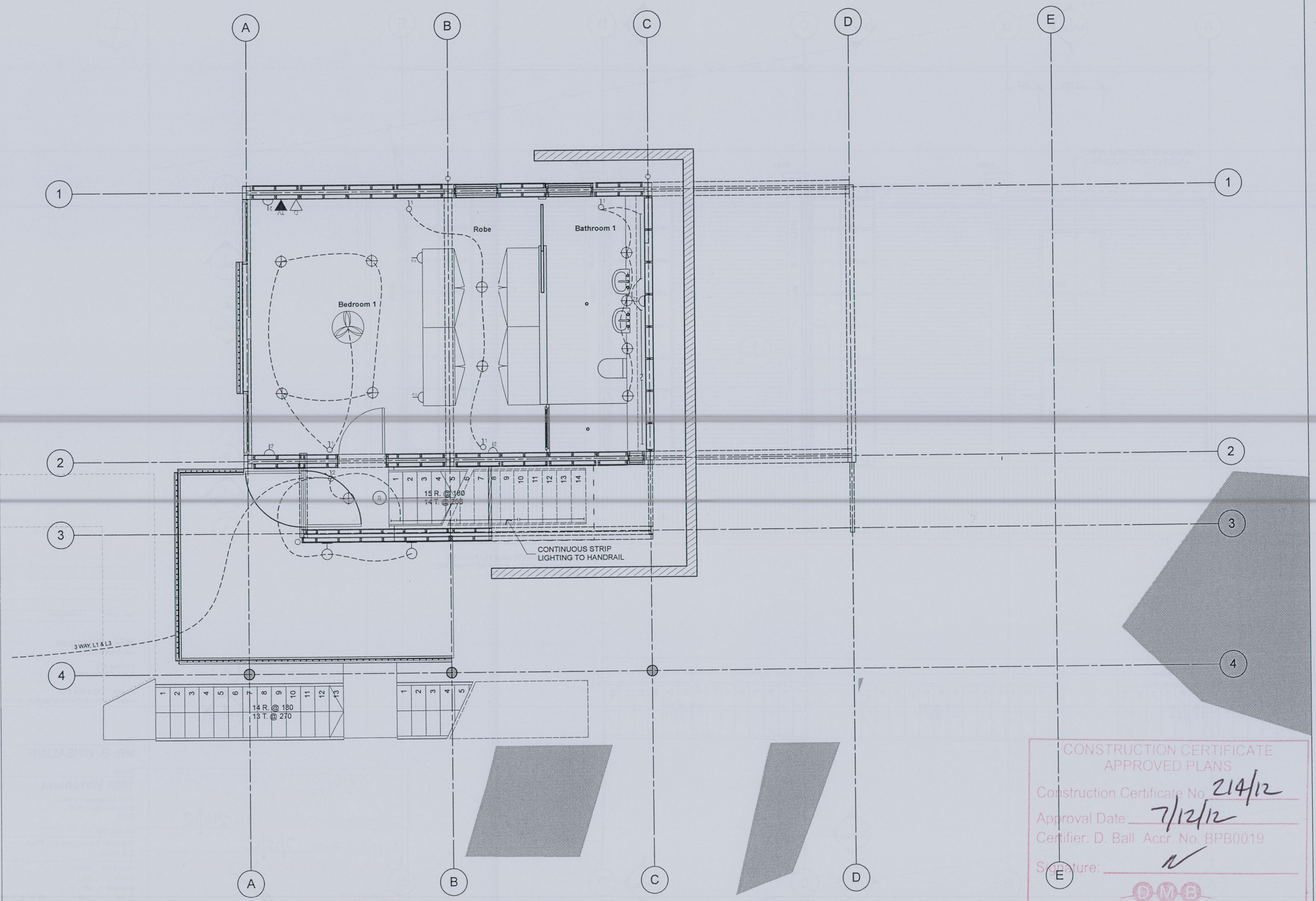

1 ELECTRICAL LAYOUT LEVEL 1
1:50

Notes

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ELECTRICAL LEGEND

- WIRING
- FLUORESCENT / LED
- LIGHT
- WALL WASHER
- LIGHT SWITCH
- 2-WAY LIGHT SWITCH
- SMOKE SENSOR
- MOTION SENSOR
- DOUBLE GPO
- DOUBLE WEATHERPROOF GPO
- TV POINT
- TELEPHONE POINT
- DATA POINT
- INTERCOM
- METER BOX
- CEILING FAN
- TAP
- HOT WATER SERVICE

Rev. Date Description

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ABN 19 665 321 421

PO Box 417
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Client
MR. B. WHEALING

Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
Electrical Layouts
Level 1

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:50	@ SHEET SIZE A2
Date	29/04/2011	

Drawing No
A-111-001

Phase
FOR CONSTRUCTION CERT.

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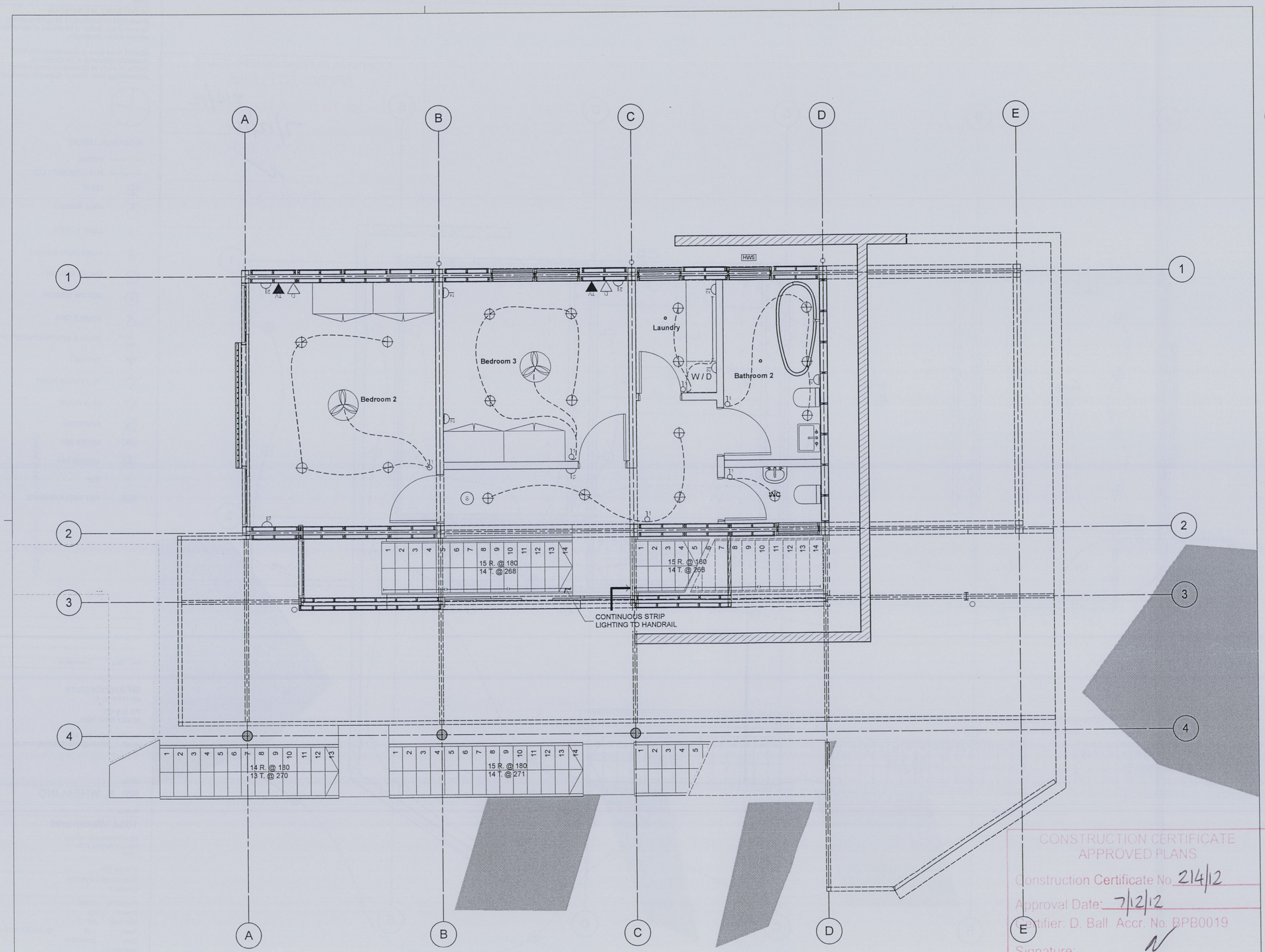

1 ELECTRICAL LAYOUT LEVEL 2
1:50

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Notes

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ELECTRICAL LEGEND

- WIRING
- FLUORESCENT / LED
- LIGHT
- WALL WASHER
- LIGHT SWITCH
- 2-WAY LIGHT SWITCH
- SMOKE SENSOR
- MOTION SENSOR
- DOUBLE GPO
- DOUBLE WEATHERPROOF GPO
- TV POINT
- TELEPHONE POINT
- DATA POINT
- INTERCOM
- METER BOX
- CEILING FAN
- TAP
- HOT WATER SERVICE

Rev. Date Description

MFArchitecture
ABN 19 665 321 421

PO Box 417
MANLY NSW 1655

mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

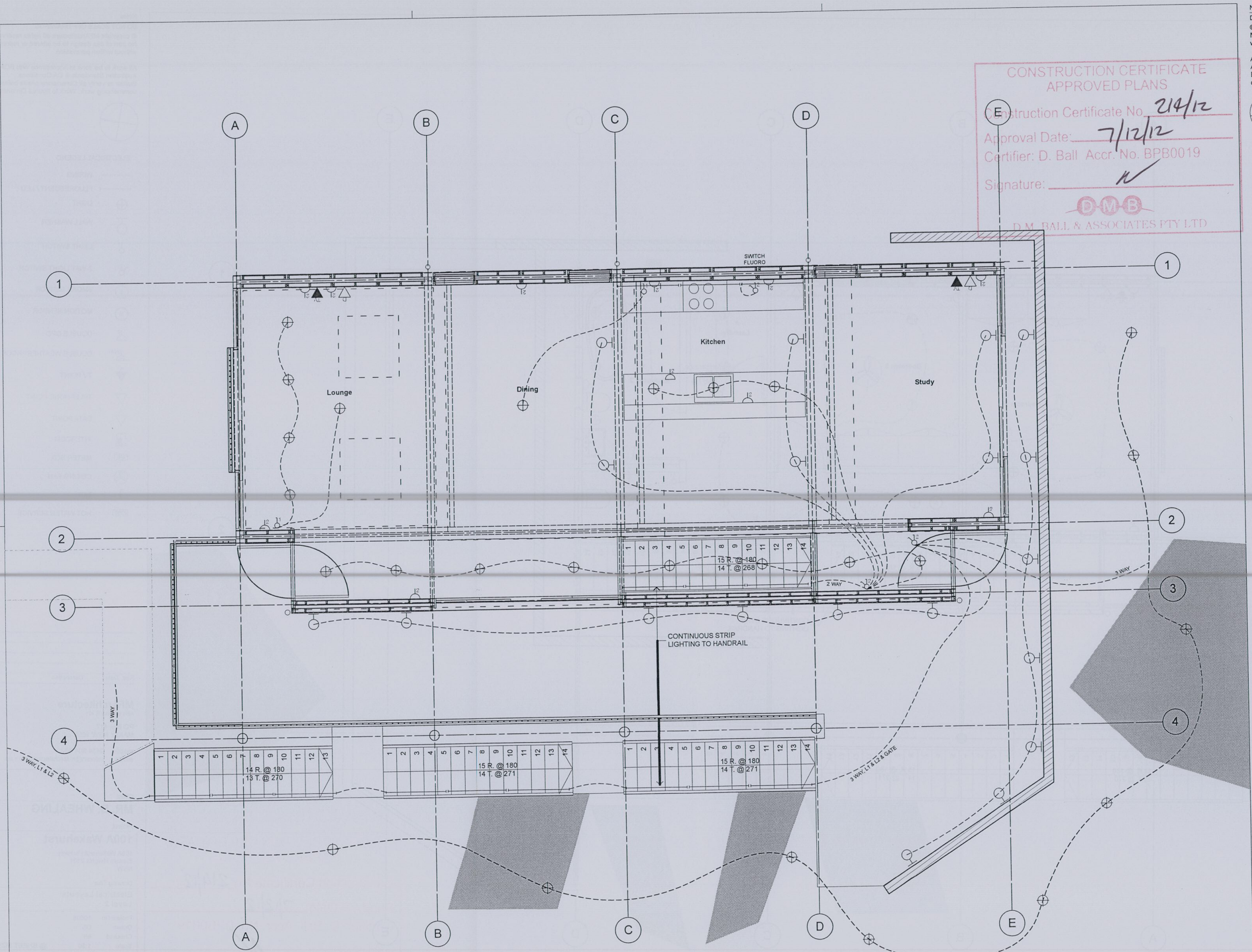
Drawing Title
Electrical Layouts
Level 2

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:50	@ SHEET SIZE A2
Date	29/04/2011	

Drawing No
A-111-002

Phase
FOR CONSTRUCTION CERT.

CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No. 214/12
Approval Date: 7/12/12
Certifier: D. Ball Accr. No. BPB0019
Signature:
D M B
D.M. BALL & ASSOCIATES PTY LTD



1 ELECTRICAL LAYOUT LEVEL 3
1:50

9:22 PM : 3/05/11 : Macintosh HD:Users:Shared:spatialresponse.net:MFA:100A wakehurst:cad:100A wakehurst AC14.pln

CONSTRUCTION CERTIFICATE
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ELECTRICAL LEGEND

- WIRING
- FLUORESCENT / LED
- LIGHT
- WALL WASHER
- LIGHT SWITCH
- 2-WAY LIGHT SWITCH
- SMOKE SENSOR
- MOTION SENSOR
- DOUBLE GPO
- DOUBLE WEATHERPROOF GPO
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- INTERCOM
- METER BOX
- CEILING FAN
- TAP
- HOT WATER SERVICE

Rev.	Date	Description

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Client
MR. B. WHEALING

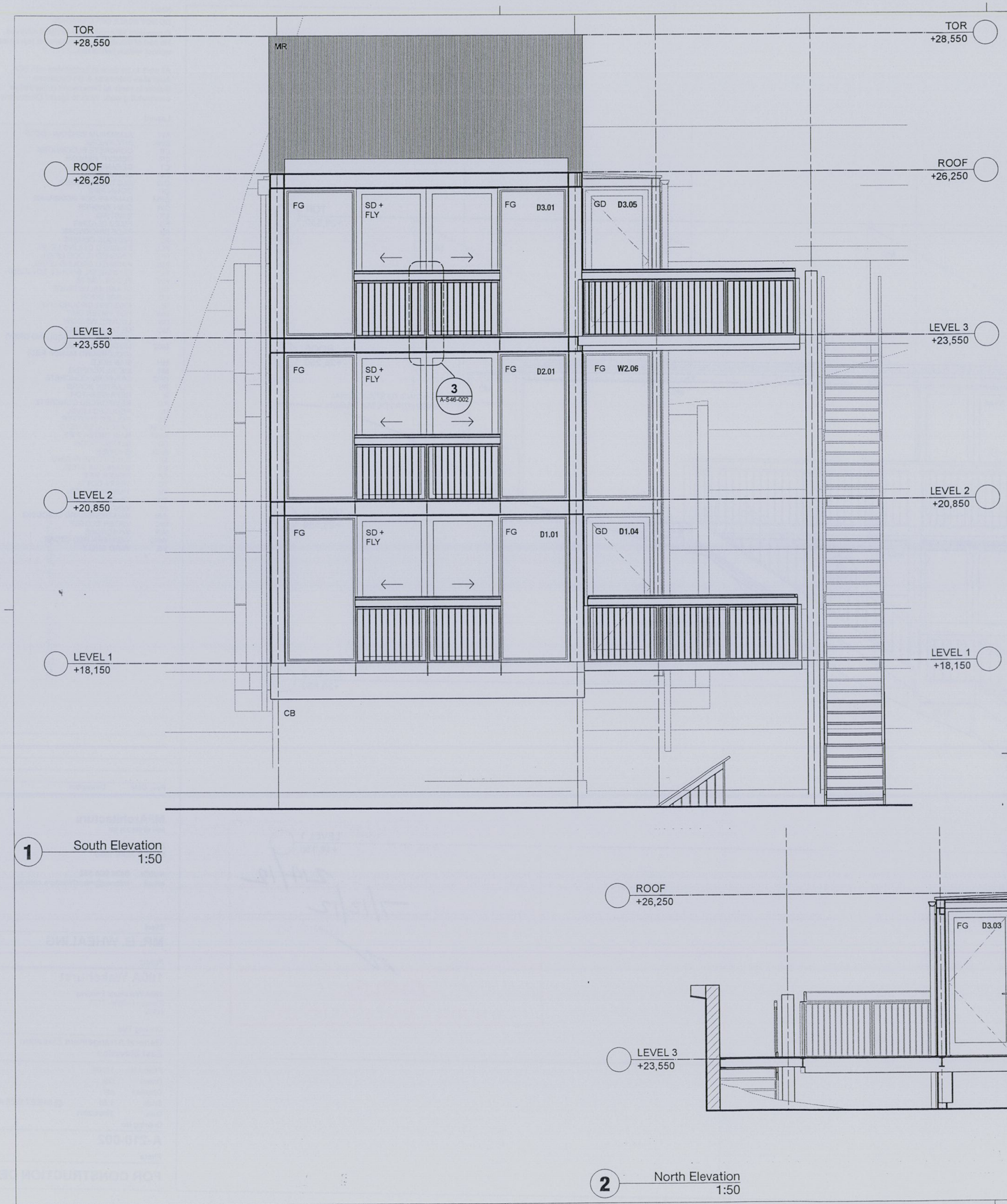
Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
Electrical Layouts
Level 3

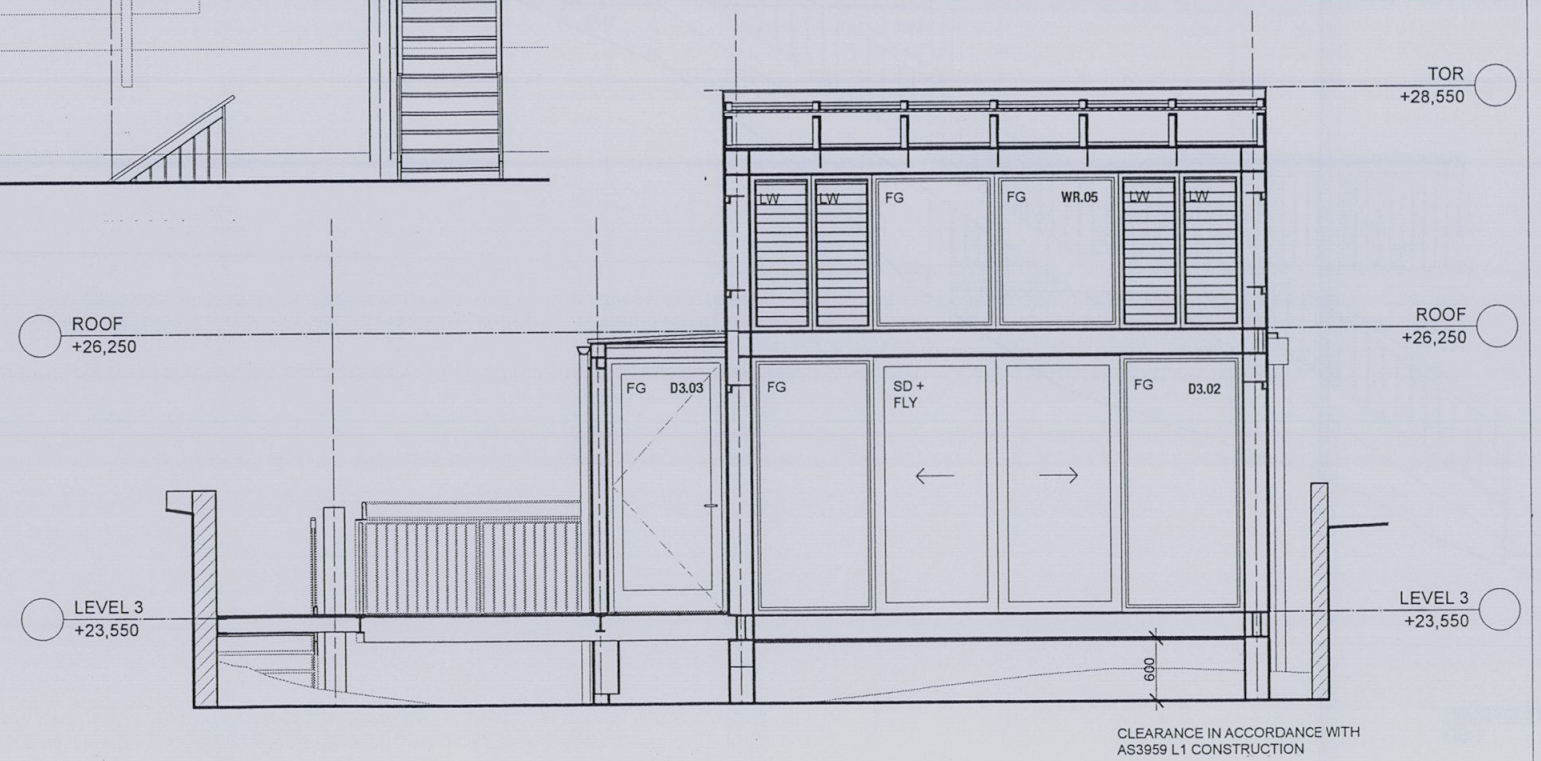
Project No	10008
Drawn	DS
Checked	MF
Scale	1:50 @ SHEET SIZE A2
Date	29/04/2011

Drawing No
A-111-003

Phase
FOR CONSTRUCTION CERT.



1 South Elevation
1:50



CLEARANCE IN ACCORDANCE WITH AS3959 L1 CONSTRUCTION

2 North Elevation
1:50

CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No. 214/12
Approval Date: 7/12/12
Certifier: D. Ball Accr. No. BPB0019
Signature:
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Notes

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Legend

AW	ALUMINIUM WINDOW - DOOR
BWK	BRICKWORK
CB	CONCRETE BLOCKWORK
CR	CEMENT RENDER
CT	CERAMIC TILE
CW	CAVITY WALL
CW	CLOTHES WASHER
DP	DOWN PIPE
DPM	DAMP-PROOF MEMBRANE
DW	DISH WASHER
EX	EXISTING
FG	FIXED GLAZING
FB	FACE BRICKWORK
FC	FIBROUS CEMENT
FCL	FINISHED CEILING LEVEL
FFL	FINISHED FLOOR LEVEL
FGL	FINISHED GROUND LEVEL
FLY	FLYSCREEN, BRONZE TO AS3959
FW	FLOOR WASTE
GB	GLASS BALUSTRADE
GD	GLASS DOOR
GL	EXISTING GROUND LINE
HW	HOT WATER UNIT
LW	LOUVRE WINDOW
MC	METAL CLADDING (COLORBOND WOODLAND GREY)
MC2	METAL CLADDING (COLORBOND MANOR RED)
MH	MAN HOLE
MR	METAL ROOFING
OFC	OFF-FORM CONCRETE
PB	PLASTER BOARD
R	REFRIGERATOR
RC	REINFORCED CONCRETE
RL	REDUCED LEVEL
RS	ROLLER SHUTTER
RWH	RAIN WATER HEAD
RWP	RAIN WATER PIPE
SD	SLIDING DOOR
SHR	SHOWER
SF	SANDSTONE FACING
SS	STAINLESS STEEL
SP	SEWER PIPE
TC	TERRA COTTA
TS	TIMBER SCREEN
TW	TIMBER WINDOW
W	WINDOW
WB	WEATHERBOARD CLADDING
WC	WATER CLOSET
WR	WARDROBE
WRC	WESTERN RED CEDAR
YG	YARD GULLY

Rev.	Date	Description

MFArchitecture
ABN 19 665 321 421

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MANLY NSW 1655

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Client
MR. B. WHEALING

Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
General Arrangement Elevation
North & South Elevation

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:50	@ SHEET SIZE A2
Date	29/04/2011	

Drawing No
A-210-001

Phase
FOR CONSTRUCTION CERT.

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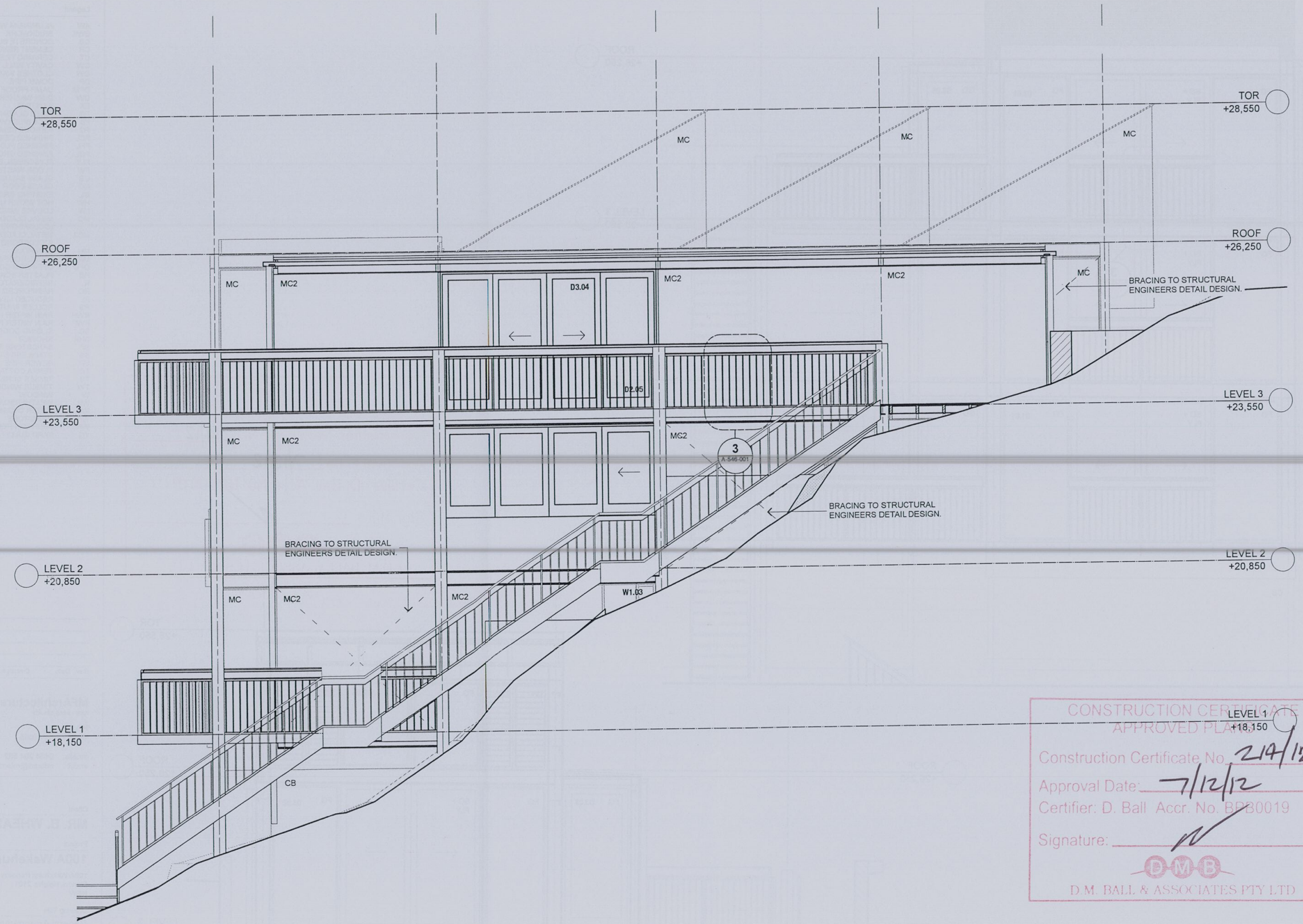

1 East Elevation
1:50

CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No. 214/12
Approval Date: 7/12/12
Certifier: D. Ball Accr. No. BPB0019
Signature:
D.M. BALL & ASSOCIATES PTY LTD

Notes

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Legend

AW	ALUMINIUM WINDOW - DOOR
BWK	BRICKWORK
CB	CONCRETE BLOCKWORK
CR	CEMENT RENDER
CT	CERAMIC TILE
CW	CAVITY WALL
CW	CLOTHES WASHER
DP	DOWN PIPE
DPM	DAMP-PROOF MEMBRANE
DW	DISH WASHER
EX	EXISTING
FG	FIXED GLAZING
FB	FACE BRICKWORK
FC	FIBROUS CEMENT
FCL	FINISHED CEILING LEVEL
FFL	FINISHED FLOOR LEVEL
FGL	FINISHED GROUND LEVEL
FLY	FLYSCREEN, BRONZE TO AS3959
FW	FLOOR WASTE
GB	GLASS BALUSTRADE
GD	GLASS DOOR
GL	EXISTING GROUND LINE
HW	HOT WATER UNIT
LW	LOUVRE WINDOW
MC	METAL CLADDING (COLORBOND WOODLAND GREY)
MC2	METAL CLADDING (COLORBOND MANOR RED)
MH	MAN HOLE
MR	METAL ROOFING
OFC	OFF-FORM CONCRETE
PB	PLASTER BOARD
R	REFRIGERATOR
RC	REINFORCED CONCRETE
RL	REDUCED LEVEL
RS	ROLLER SHUTTER
RWH	RAIN WATER HEAD
RWP	RAIN WATER PIPE
SD	SLIDING DOOR
SHR	SHOWER
SF	SANDSTONE FACING
SS	STAINLESS STEEL
SP	SEWER PIPE
TC	TERRA COTTA
TS	TIMBER SCREEN
TW	TIMBER WINDOW
W	WINDOW
WB	WEATHERBOARD CLADDING
WC	WATER CLOSET
WR	WARDROBE
WRC	WESTERN RED CEDAR
YG	YARD GULLY

Rev. Date Description

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Client
MR. B. WHEALING

Project
100A Wakehurst

100A Wakehurst Parkway
Elanora Heights 2101
NSW

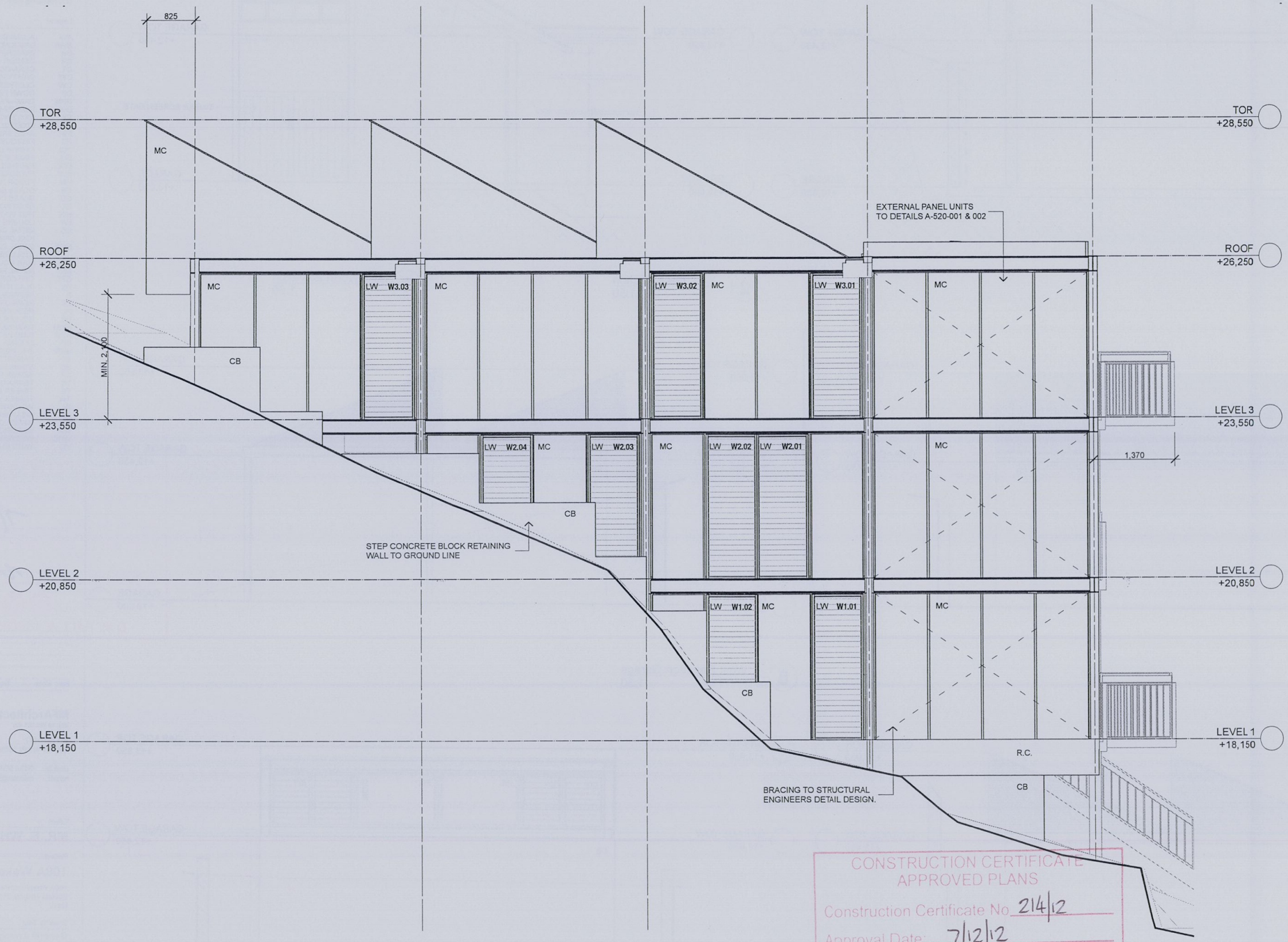
Drawing Title
General Arrangement Elevation
East Elevation

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:50	@ SHEET SIZE A2
Date	29/04/2011	

Drawing No
A-210-002

Phase
FOR CONSTRUCTION CERT.

9:22 PM : 3/05/11 : Macintosh HD:Users:Shared:spatialresponse.net:MFA:100A wakehurst:cad:100A wakehurst AC14.pln



1 West Elevation
1:50

CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No. 214/12
Approval Date: 7/12/12
Certifier: D. Ball Accr. No. BPB0019
Signature:
D.M. BALL & ASSOCIATES PTY LTD

Notes

DO NOT SCALE OFF DRAWINGS

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Legend

AW	ALUMINIUM WINDOW - DOOR
BWK	BRICKWORK
CB	CONCRETE BLOCKWORK
CR	CEMENT RENDER
CT	CERAMIC TILE
CW	CAVITY WALL
CW	CLOTHES WASHER
DP	DOWN PIPE
DPM	DAMP-PROOF MEMBRANE
DW	DISH WASHER
EX	EXISTING
FG	FIXED GLAZING
FB	FACE BRICKWORK
FC	FIBROUS CEMENT
FCL	FINISHED CEILING LEVEL
FFL	FINISHED FLOOR LEVEL
FGL	FINISHED GROUND LEVEL
FLY	FLYSCREEN, BRONZE TO AS3959
FW	FLOOR WASTE
GB	GLASS BALUSTRADE
GD	GLASS DOOR
GL	EXISTING GROUND LINE
HW	HOT WATER UNIT
LW	LOUVRE WINDOW
MC	METAL CLADDING (COLORBOND WOODLAND GREY)
MC2	METAL CLADDING (COLORBOND MANOR RED)
MH	MAN HOLE
MR	METAL ROOFING
OFC	OFF-FORM CONCRETE
PB	PLASTER BOARD
R	REFRIGERATOR
RC	REINFORCED CONCRETE
RL	REDUCED LEVEL
RS	ROLLER SHUTTER
RWH	RAIN WATER HEAD
RWP	RAIN WATER PIPE
SD	SLIDING DOOR
SHR	SHOWER
SF	SANDSTONE FACING
SS	STAINLESS STEEL
SP	SEWER PIPE
TC	TERRA COTTA
TS	TIMBER SCREEN
TW	TIMBER WINDOW
W	WINDOW
WB	WEATHERBOARD CLADDING
WC	WATER CLOSET
WR	WARDROBE
WRC	WESTERN RED CEDAR
YG	YARD GULLY

Rev. Date Description

MFArchitecture
ABN 19 665 321 421

PO Box 417
MANLY NSW 1655

mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
General Arrangement Elevation
West Elevation

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:50	@ SHEET SIZE A2
Date	29/04/2011	
Drawing No		

A-210-003

Phase
FOR CONSTRUCTION CERT.

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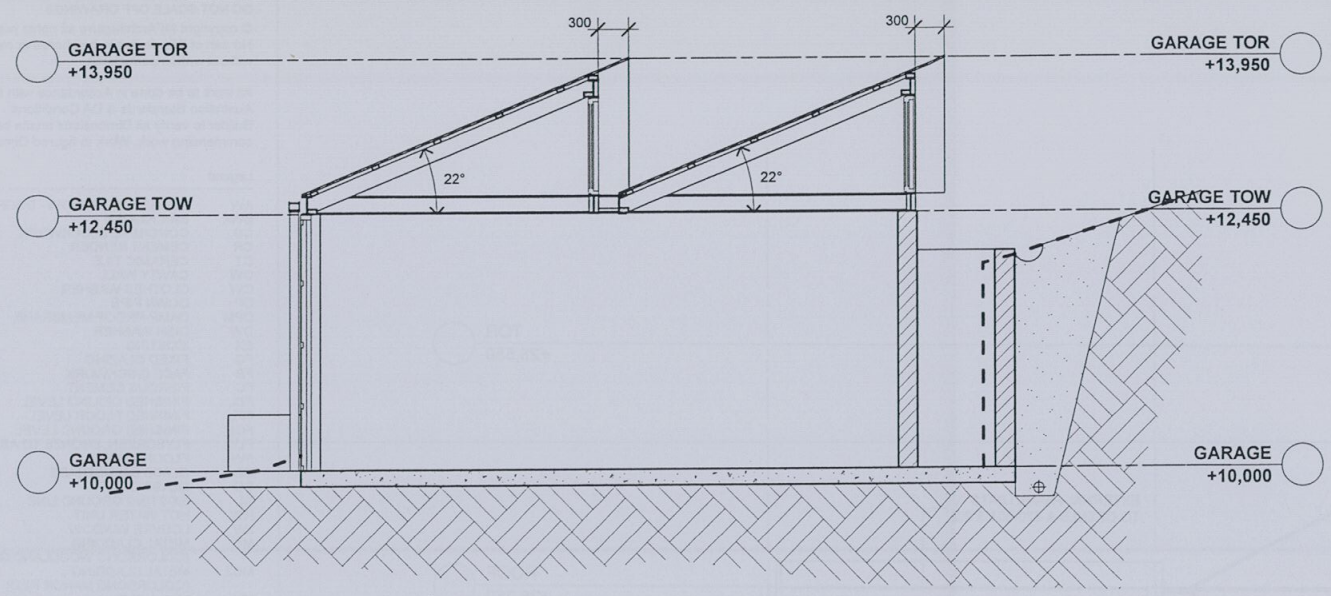
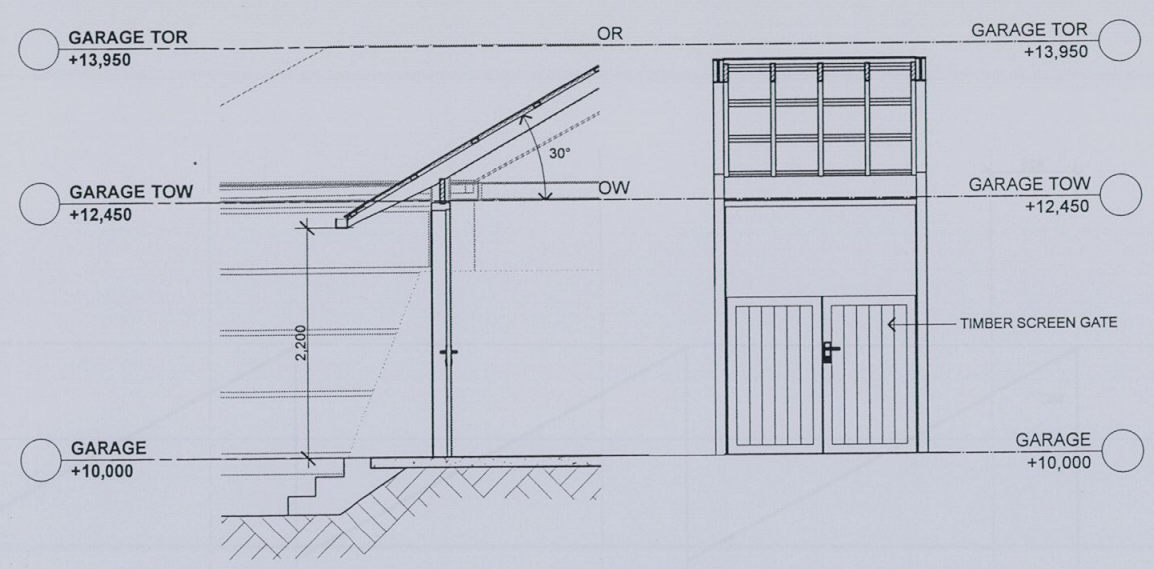
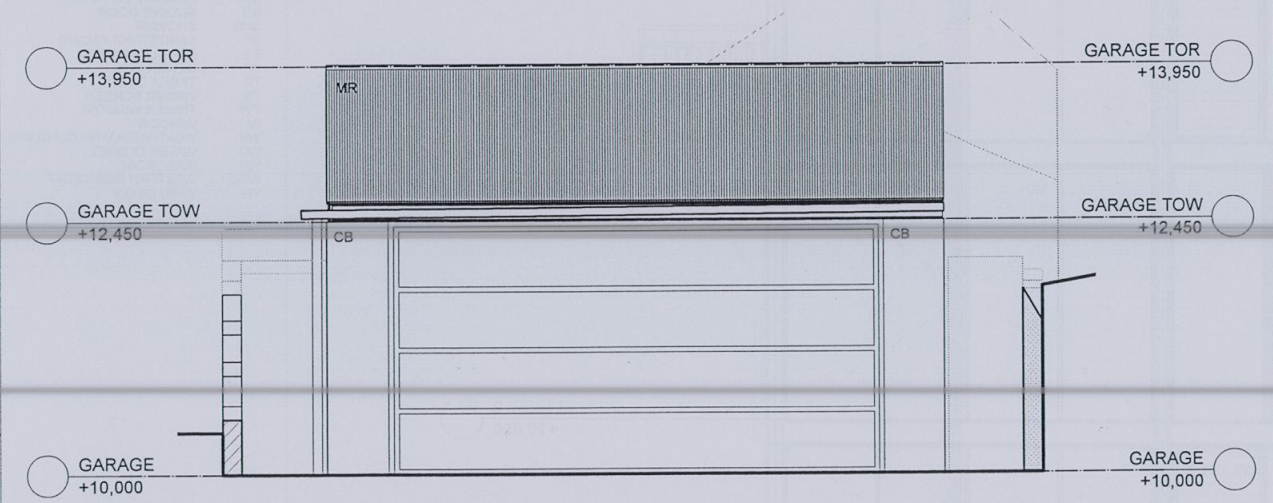


1 Garage Cross Section
1:50

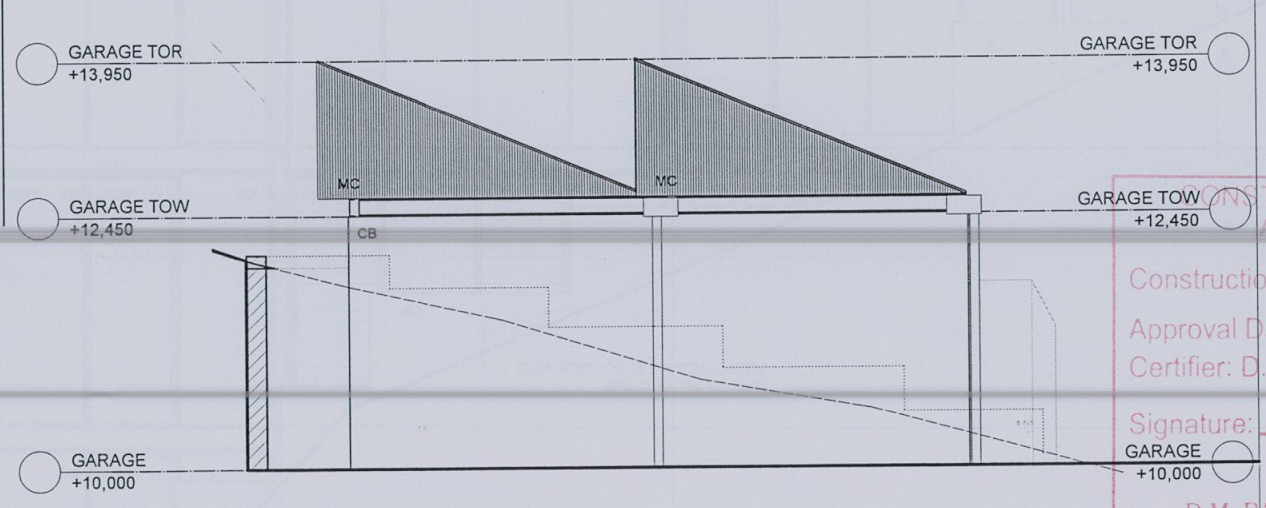


2 Gate Section
1:50

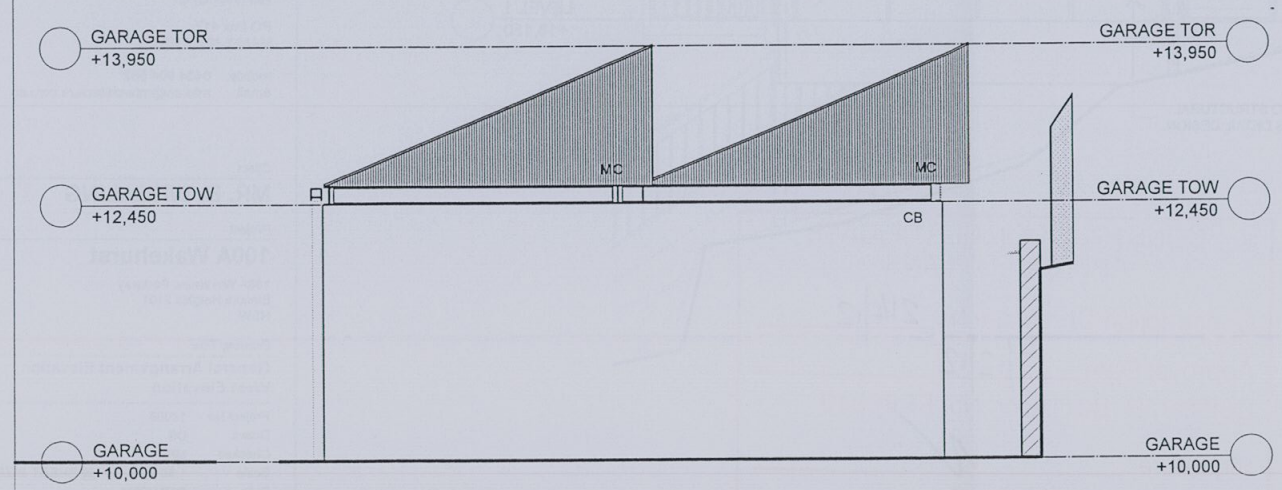
3 Gate North Elevation
1:50



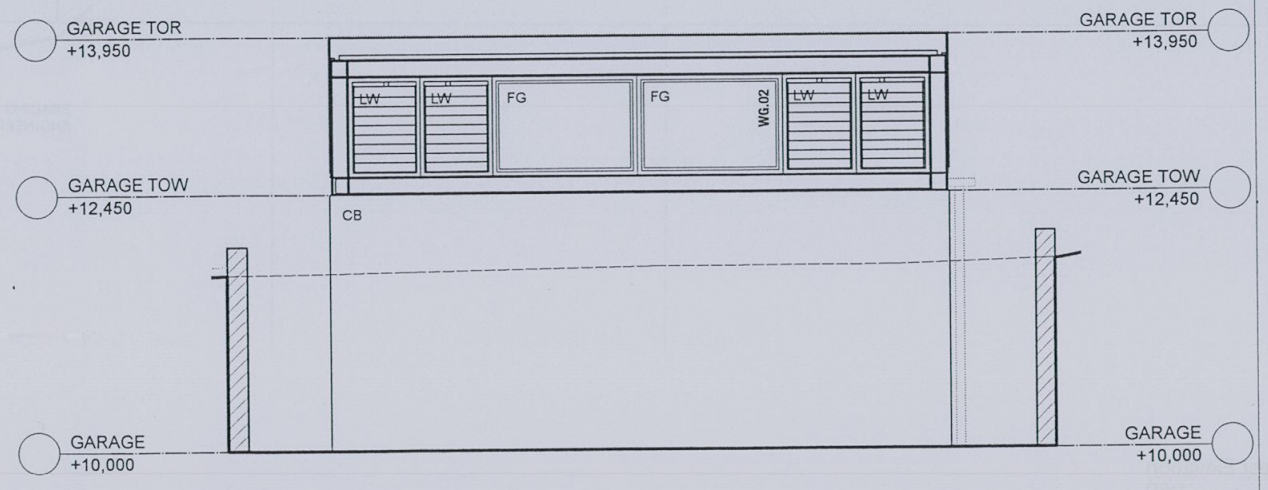
4 South Elevation Garage
1:50



5 West Elevation Garage
1:50



6 East Elevation Garage
1:50



7 North Elevation Garage
1:50

Notes

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Legend

AW	ALUMINIUM WINDOW - DOOR
BWK	BRICKWORK
CB	CONCRETE BLOCKWORK
CR	CEMENT RENDER
CT	CERAMIC TILE
CW	CAVITY WALL
CW	CLOTHES WASHER
DP	DOWN PIPE
DPM	DAMP-PROOF MEMBRANE
DW	DISH WASHER
EX	EXISTING
FG	FIXED GLAZING
FB	FACE BRICKWORK
FC	FIBROUS CEMENT
FCL	FINISHED CEILING LEVEL
FFL	FINISHED FLOOR LEVEL
FGL	FINISHED GROUND LEVEL
FLY	FLYSCREEN, BRONZE TO AS3959
FW	FLOOR WASTE
GB	GLASS BALUSTRADE
GD	GLASS DOOR
GL	EXISTING GROUND LINE
HW	HOT WATER UNIT
LW	LOUVRE WNDOW
MC	METAL CLADDING (COLORBOND WOODLAND GREY)
MC2	METAL CLADDING (COLORBOND MANOR RED)
MH	MAN HOLE
MR	METAL ROOFING
OFC	OFF-FORM CONCRETE
PB	PLASTER BOARD
R	REFRIGERATOR
RC	REINFORCED CONCRETE
RL	REDUCED LEVEL
RS	ROLLER SHUTTER
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RWP	RAIN WATER PIPE
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W	WINDOW
WB	WEATHERBOARD CLADDING
WC	WATER CLOSET
WR	WARDROBE
WRC	WESTERN RED CEDAR
YG	YARD GULLY

Rev.	Date	Description

MFArchitecture
ABN 19 665 321 421

PO Box 417
MANLY NSW 1655

mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

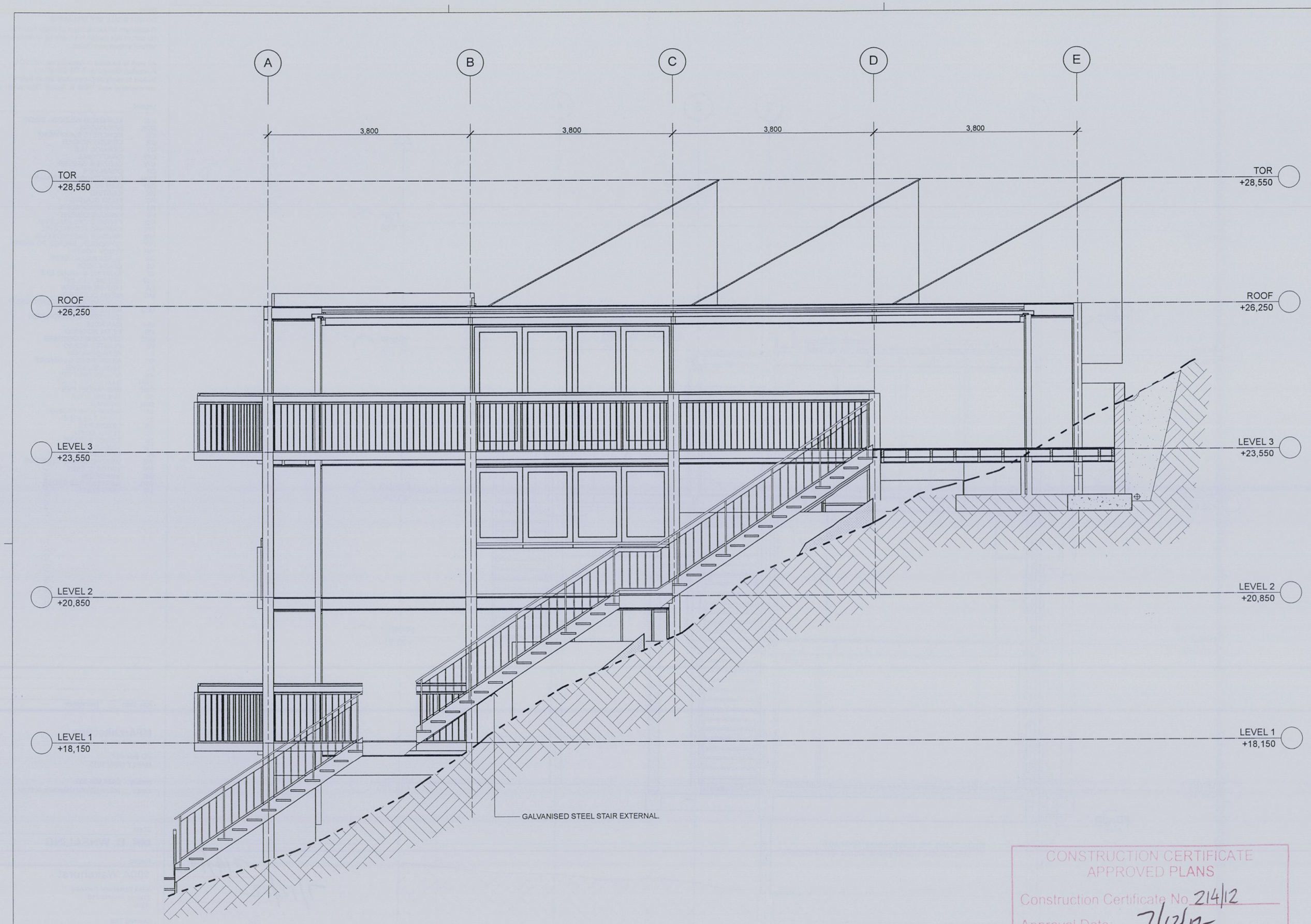
Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
General Arrangement Elevation Garage

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:50	@ SHEET SIZE A2
Date	29/04/2011	

Drawing No
A-210-004

Phase
FOR CONSTRUCTION CERT.



1 Long. Section Deck
1:50

CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No 214/12
Approval Date: 7/12/11
Certifier: D. Ball Accr. No. BPB0019
Signature:
D.M. BALL & ASSOCIATES PTY LTD

Notes

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YG	YARD GULLY

Rev.	Date	Description

MFArchitecture
ABN 19 665 321 421

PO Box 417
MANLY NSW 1655

mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
General Arrangement Section
Longitudinal Section 3

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:50	@ SHEET SIZE A2
Date	29/04/2011	
Drawing No		

A-310-003

Phase
FOR CONSTRUCTION CERT.

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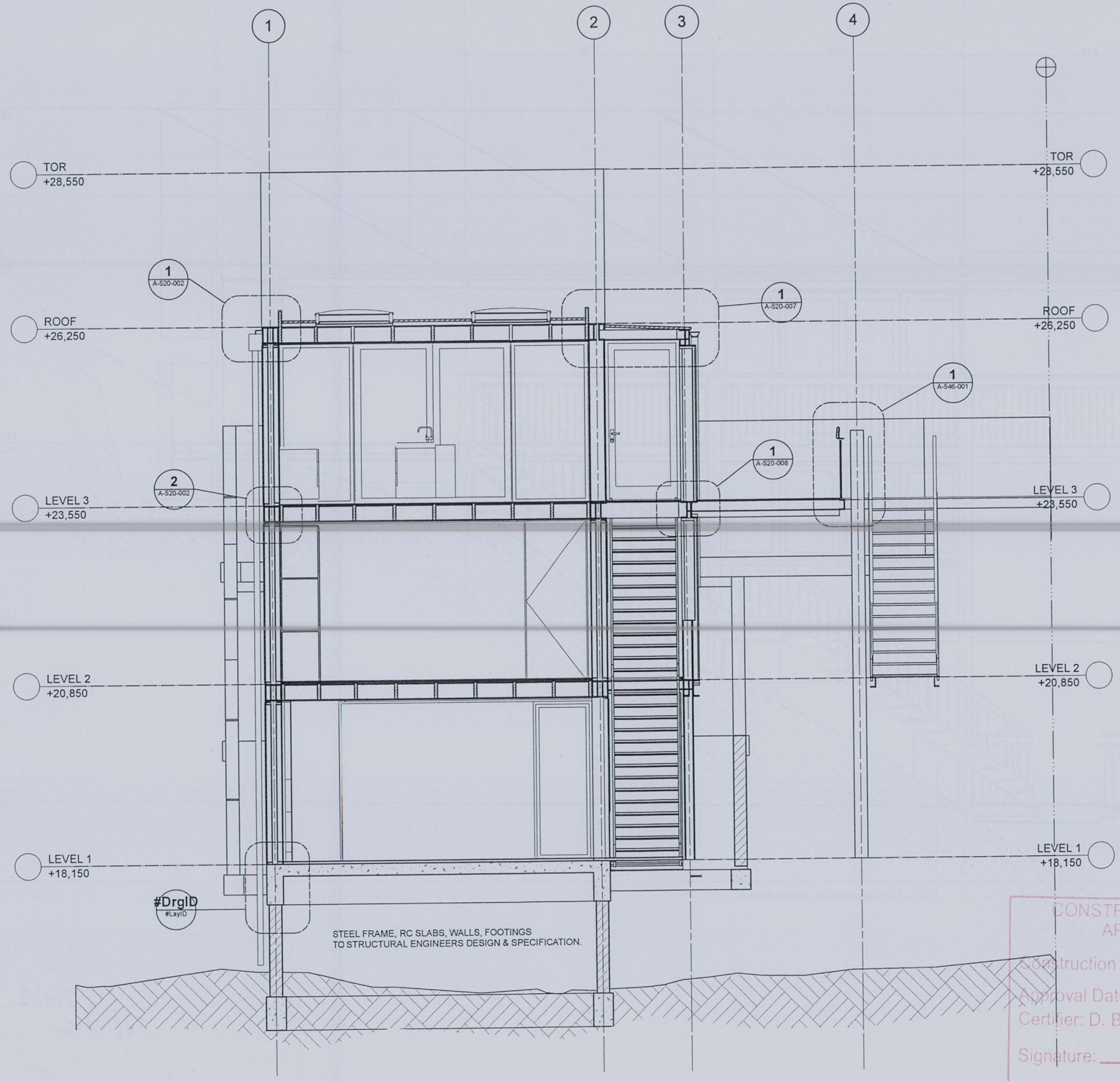

1 Cross Section AB
1:50

Notes

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CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No 214/12
Approval Date: 7/12/12
Certifier: D. Ball Accr. No. BPB0019
Signature:
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Rev. Date Description

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Client
MR. B. WHEALING

Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
General Arrangement Section
Cross Section 1

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:50	@ SHEET SIZE A2
Date	29/04/2011	

Drawing No
A-310-004

Phase
FOR CONSTRUCTION CERT.

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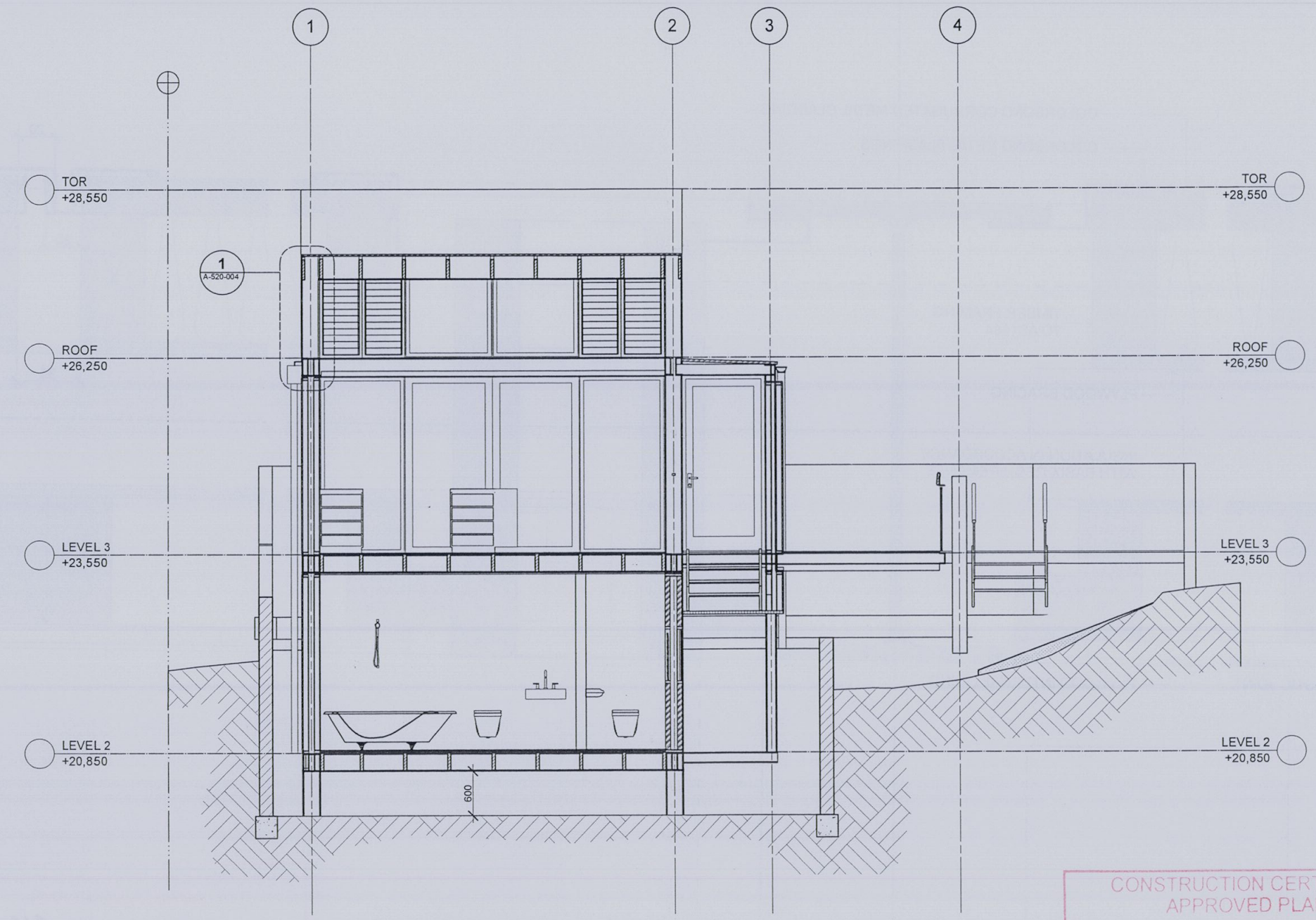

1 Cross Section D
1:50

CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No. 214/12
Approval Date: 7/12/12
Certifier: D. Ball Accr. No. BPB0019
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Rev. Date Description

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ABN 19 665 321 421

PO Box 417
MANLY NSW 1655

mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
General Arrangement Section
Cross Section 2

Project No	10008
Drawn	DS
Checked	MF
Scale	1:50 @ SHEET SIZE A2
Date	29/04/2011
Drawing No	A-310-005
Phase	FOR CONSTRUCTION CERT.

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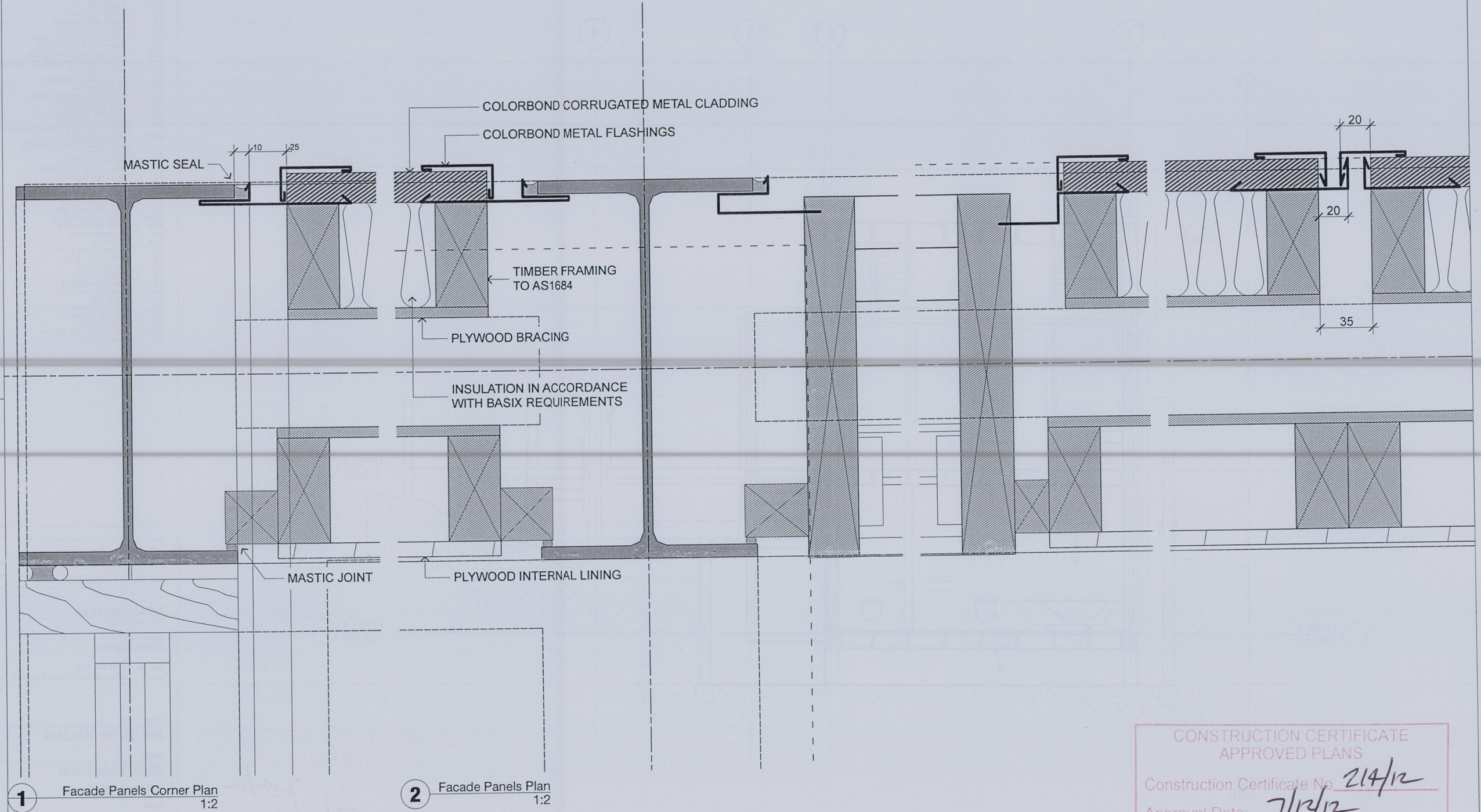

1 Facade Panels Corner Plan
1:2

2 Facade Panels Plan
1:2

Notes

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CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No. 214/12
Approval Date: 7/12/12
Certifier: D. Ball Accr. No. BPB0019
Signature:
D.M. BALL & ASSOCIATES PTY LTD

Rev. Date Description

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ABN 19 665 321 421

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MANLY NSW 1655

mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
Envelope Details
Wall Panel Details Plan

Project No	10008
Drawn	DS
Checked	MF
Scale	1:2, 1:50 @ SHEET SIZE A2
Date	29/04/2011

Drawing No
A-520-001

Phase
FOR CONSTRUCTION CERT.

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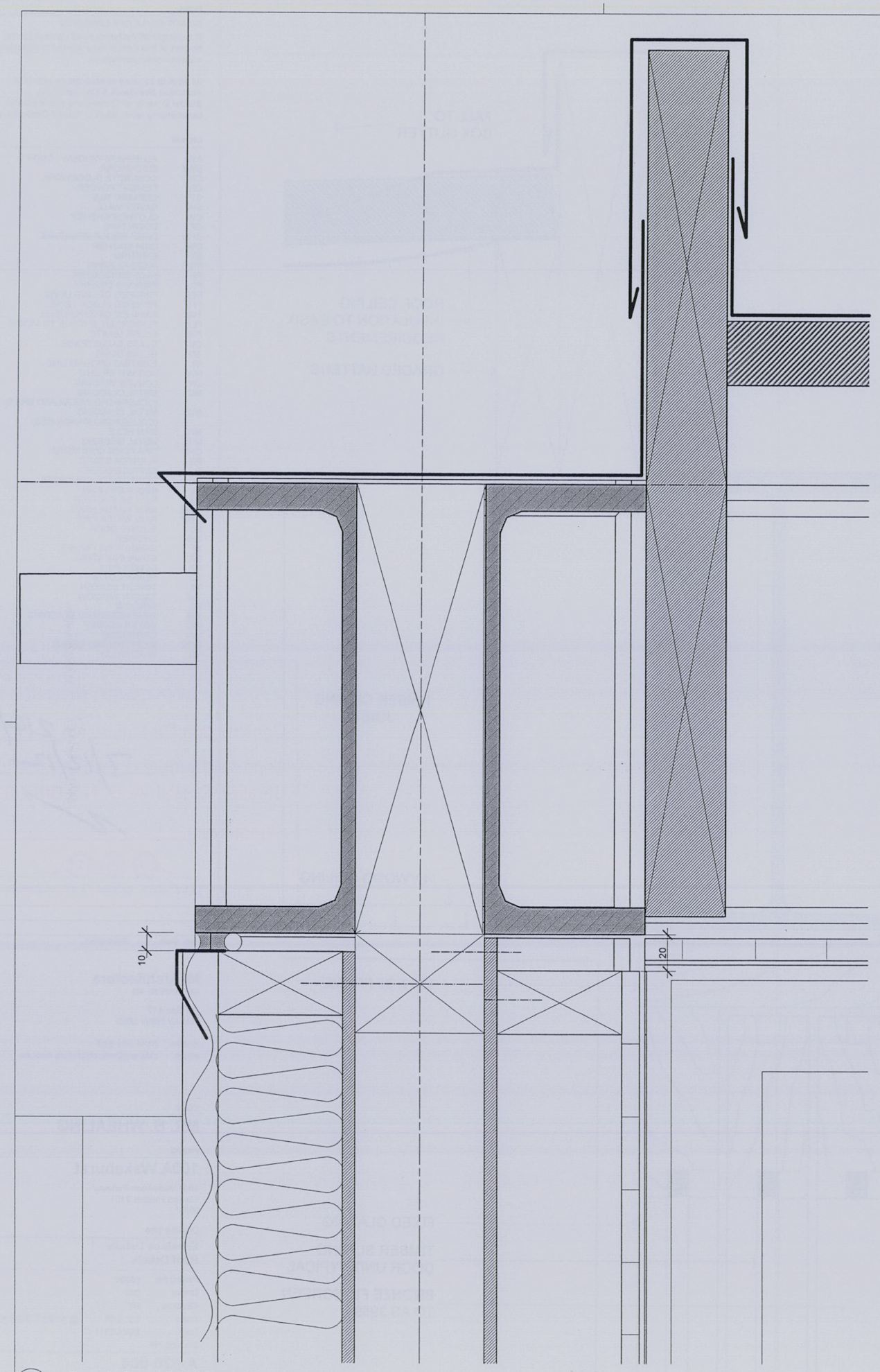
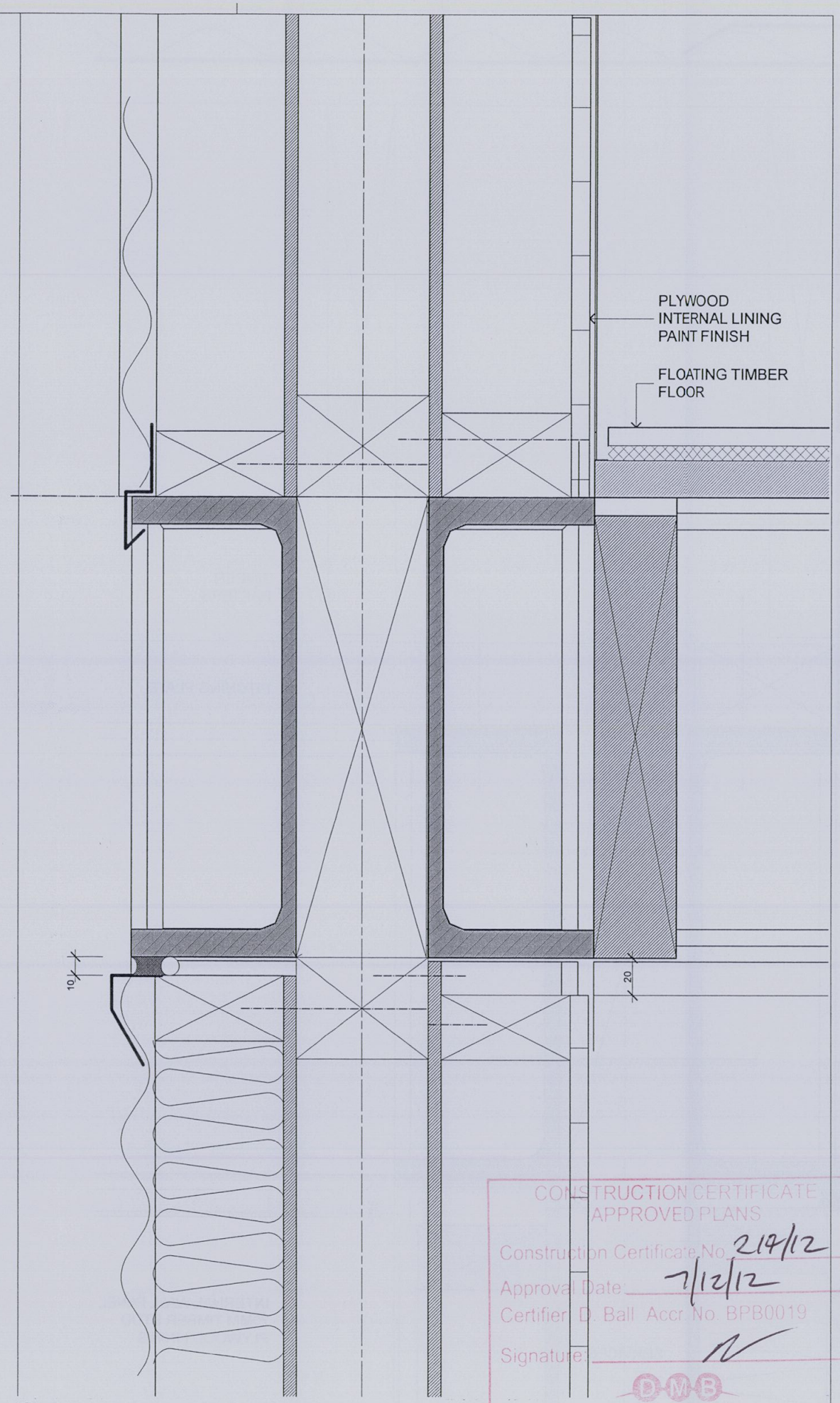


1 Facade Panel Roof Connection Section
A-310-004 1:2



2 Facade Panel Beam Connection Section
1:2

Notes

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Rev. Date Description

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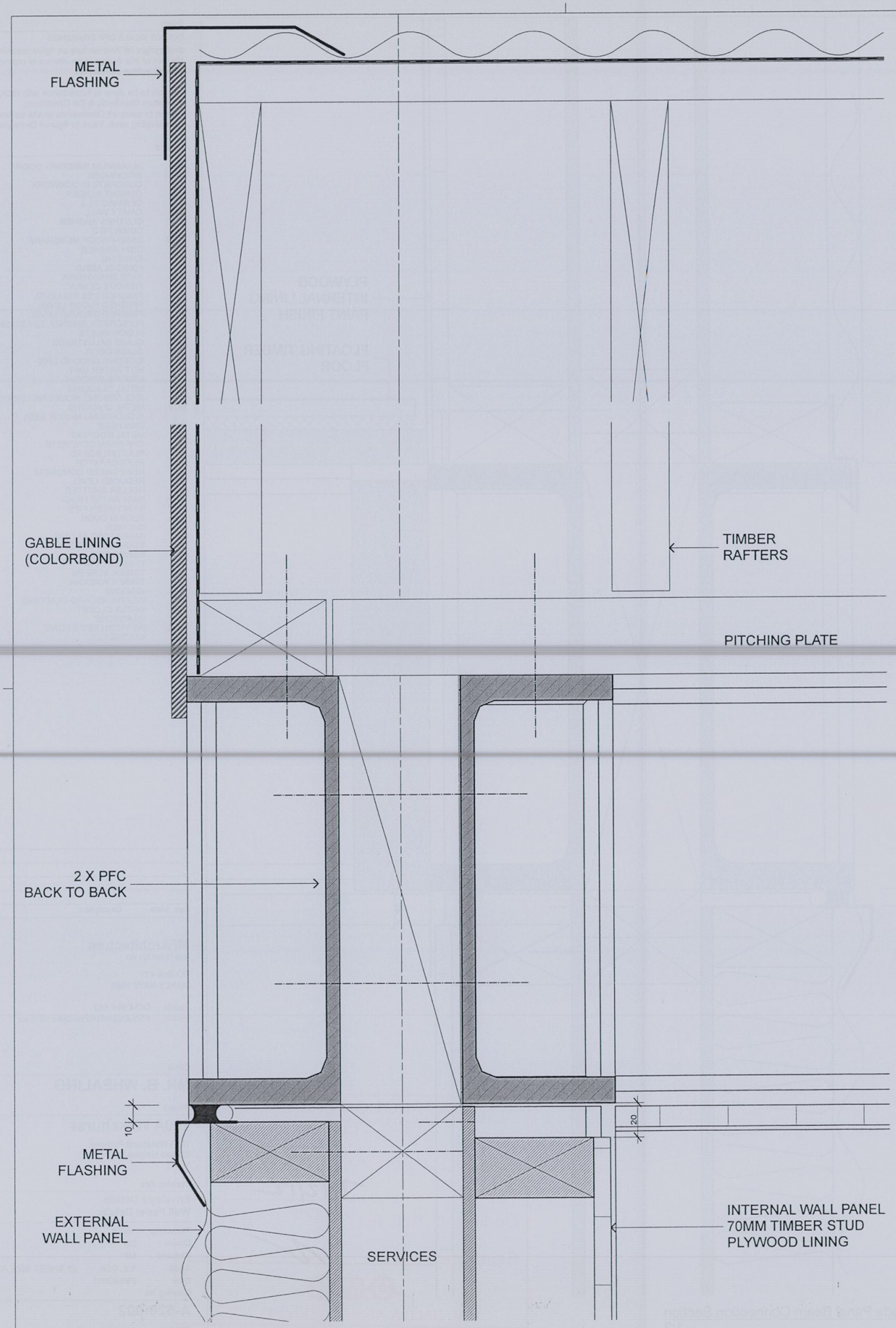
Client
MR. B. WHEALING

Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

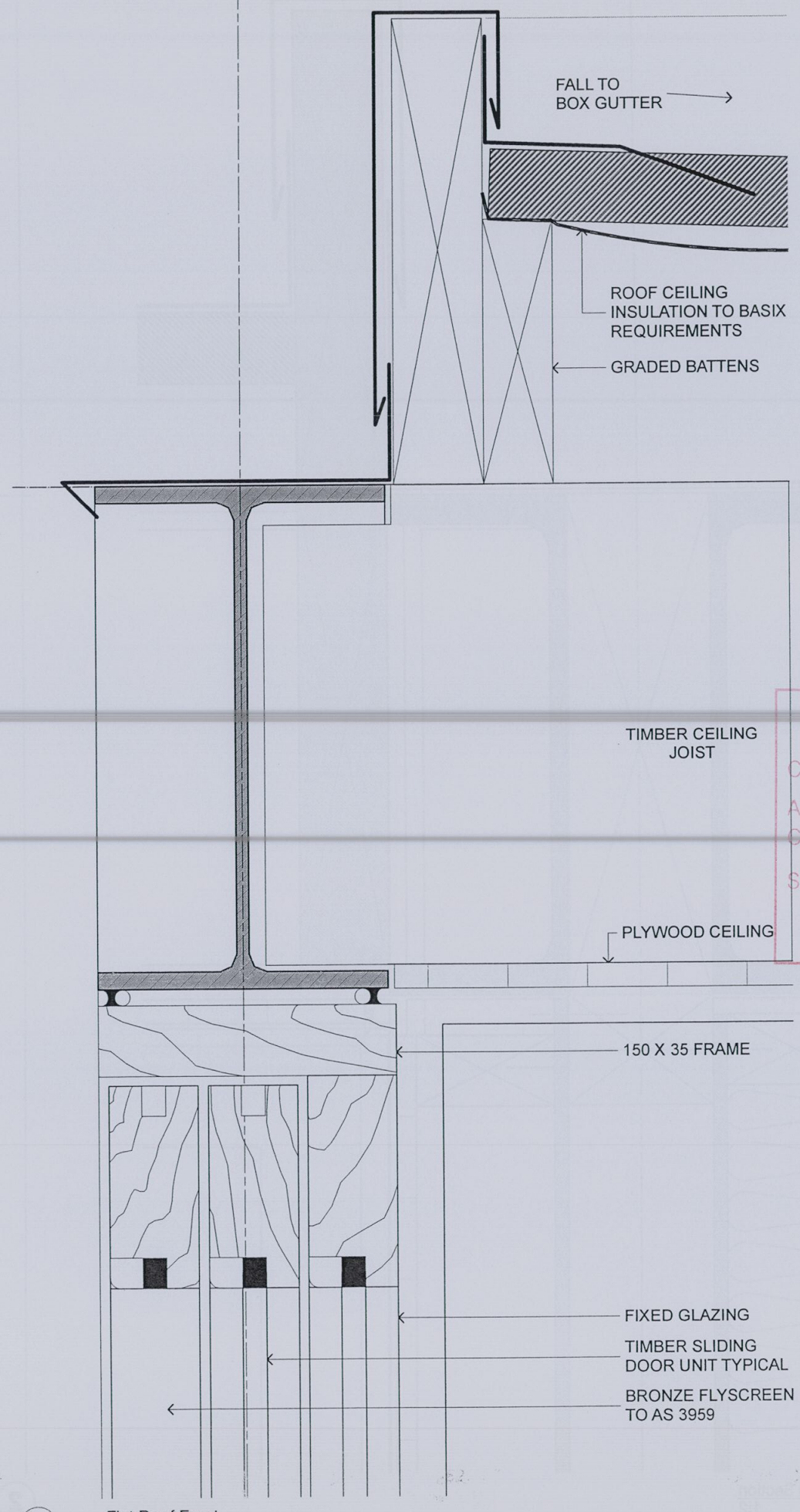
Drawing Title
Envelope Details
Wall Panel Details

Project No	10008
Drawn	DS
Checked	MF
Scale	1:2, 1:50 @ SHEET SIZE A2
Date	29/04/2011
Drawing No	A-520-002
Phase	FOR CONSTRUCTION CERT.

9:23 PM : 3/05/11 : Macintosh HD:Users:Shared:spatialresponse.net:MFA:100A wakehurst:cad:100A wakehurst AC14.pln



1 Roof Rafter Cross 1:2



2 Flat Roof Front 1:2

9:23 PM : 3/05/11 : Macintosh HD:Users:Shared:spatialresponse.net:MFA:100A wakehurst:cad:100A wakehurst AC14.pln

Notes

DO NOT SCALE OFF DRAWINGS

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Builder to verify all Dimensions onsite before commencing work. Work to figured Dimensions only.

Legend

AW	ALUMINIUM WINDOW - DOOR
BWK	BRICKWORK
CB	CONCRETE BLOCKWORK
CR	CEMENT RENDER
CT	CERAMIC TILE
CW	CAVITY WALL
CW	CLOTHES WASHER
DP	DOWN PIPE
DPM	DAMP-PROOF MEMBRANE
DW	DISH WASHER
EX	EXISTING
FG	FIXED GLAZING
FB	FACE BRICKWORK
FC	FIBROUS CEMENT
FCL	FINISHED CEILING LEVEL
FFL	FINISHED FLOOR LEVEL
FGL	FINISHED GROUND LEVEL
FLY	FLYSCREEN, BRONZE TO AS3959
FW	FLOOR WASTE
GB	GLASS BALUSTRADE
GD	GLASS DOOR
GL	EXISTING GROUND LINE
HW	HOT WATER UNIT
LW	LOUVRE WINDOW
MC	METAL CLADDING (COLORBOND WOODLAND GREY)
MC2	METAL CLADDING (COLORBOND MANOR RED)
MH	MAN HOLE
MR	METAL ROOFING
OFC	OFF-FORM CONCRETE
PB	PLASTER BOARD
R	REFRIGERATOR
RC	REINFORCED CONCRETE
RL	REDUCED LEVEL
RS	ROLLER SHUTTER
RWH	RAIN WATER HEAD
RWP	RAIN WATER PIPE
SD	SLIDING DOOR
SHR	SHOWER
SF	SANDSTONE FACING
SS	STAINLESS STEEL
SP	SEWER PIPE
TC	TERRA COTTA
TS	TIMBER SCREEN
TW	TIMBER WINDOW
W	WINDOW
WB	WEATHERBOARD CLADDING
WC	WATER CLOSET
WR	WARDROBE
WRC	WESTERN RED CEDAR
YG	YARD GULLY

CONSTRUCTION CERTIFICATE APPROVED PLANS
Construction Certificate No 214/12
Approval Date: 7/12/12
Certifier: D. Ball Accr. No. BPB0019
Signature:
D M B
D.M. BALL & ASSOCIATES PTY LTD

Rev. Date Description

MFArchitecture
ABN 19 665 321 421

PO Box 417
MANLY NSW 1655

mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

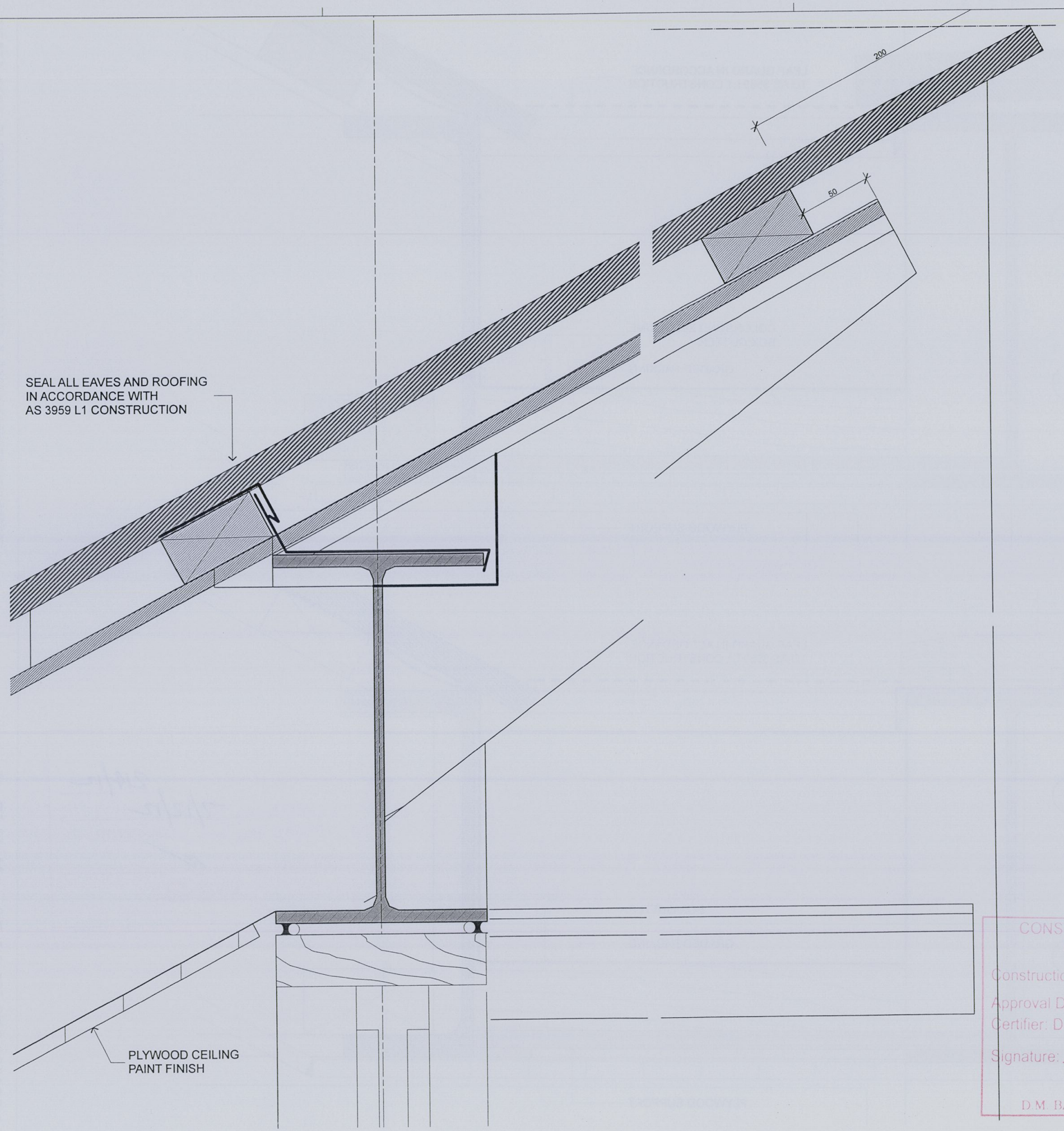
Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
Envelope Details
Roof Details

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:2, 1:50	@ SHEET SIZE A2
Date	29/04/2011	

Drawing No
A-520-004

Phase
FOR CONSTRUCTION CERT.



1 Jack Rafter
1:2

9:23 PM : 3/05/11 : Macintosh HD:Users:Shared:spatialresponse.net:MFA:100A wakehurst:cad:100A wakehurst AC14.pln

Notes

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Legend

AW	ALUMINIUM WINDOW - DOOR
BWK	BRICKWORK
CB	CONCRETE BLOCKWORK
CR	CEMENT RENDER
CT	CERAMIC TILE
CW	CAVITY WALL
CW	CLOTHES WASHER
DP	DOWN PIPE
DPM	DAMP-PROOF MEMBRANE
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EX	EXISTING
FG	FIXED GLAZING
FB	FACE BRICKWORK
FC	FIBROUS CEMENT
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MR	METAL ROOFING
OFC	OFF-FORM CONCRETE
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SHR	SHOWER
SF	SANDSTONE FACING
SS	STAINLESS STEEL
SP	SEWER PIPE
TC	TERRA COTTA
TS	TIMBER SCREEN
TW	TIMBER WINDOW
W	WINDOW
WB	WEATHERBOARD CLADDING
WC	WATER CLOSET
WR	WARDROBE
WRC	WESTERN RED CEDAR
YG	YARD GULLY

CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No. 214/12
Approval Date 7/12/12
Certifier: D. Ball Accr. No. BPB0019
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Rev. Date Description

MFArchitecture
ABN 19 665 321 421

PO Box 417
MANLY NSW 1655

mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

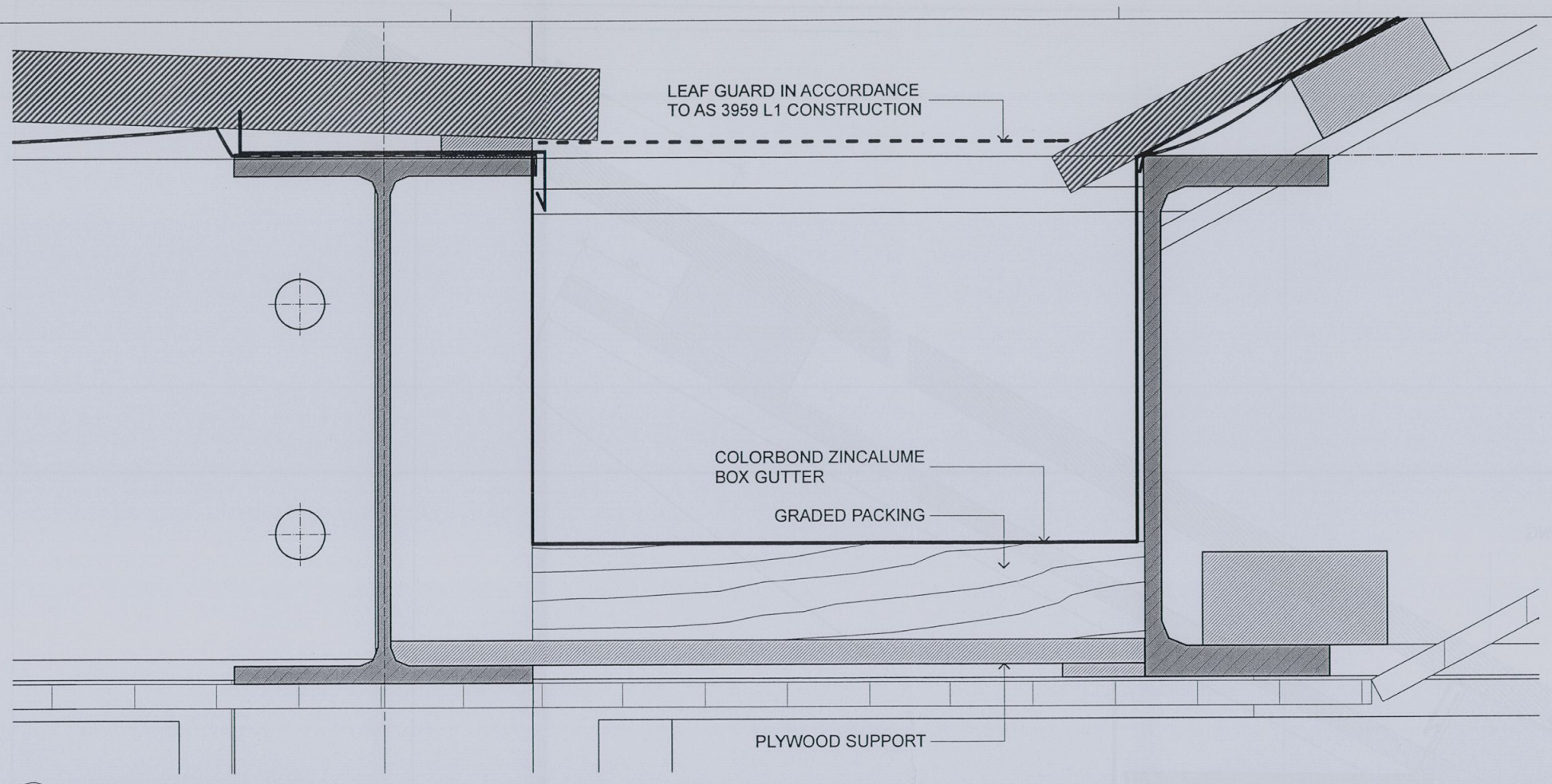
Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
Envelope Details
Jack Rafter Section

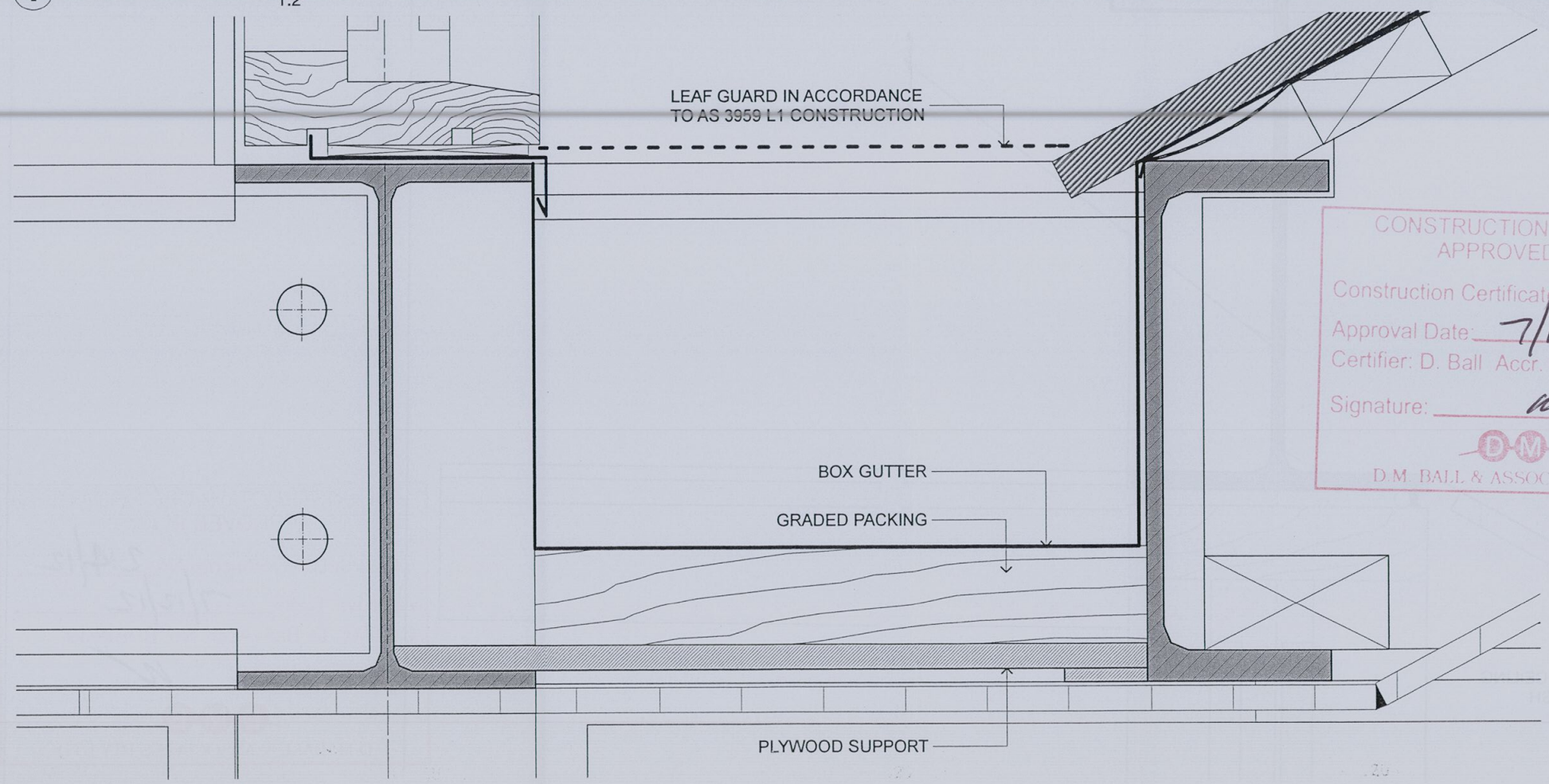
Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:2, 1:50	@ SHEET SIZE A2
Date	29/04/2011	
Drawing No		

A-520-005

Phase
FOR CONSTRUCTION CERT.



1 Flat Roof Box Gutter Section
1:2



2 Shed Roof Box Gutter Section
1:2

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Notes

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Legend

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TW	TIMBER WINDOW
W	WINDOW
WB	WEATHERBOARD CLADDING
WC	WATER CLOSET
WR	WARDROBE
WRC	WESTERN RED CEDAR
YG	YARD GULLY

CONSTRUCTION CERTIFICATE
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Rev. Date Description

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mobile: 0434 904 582
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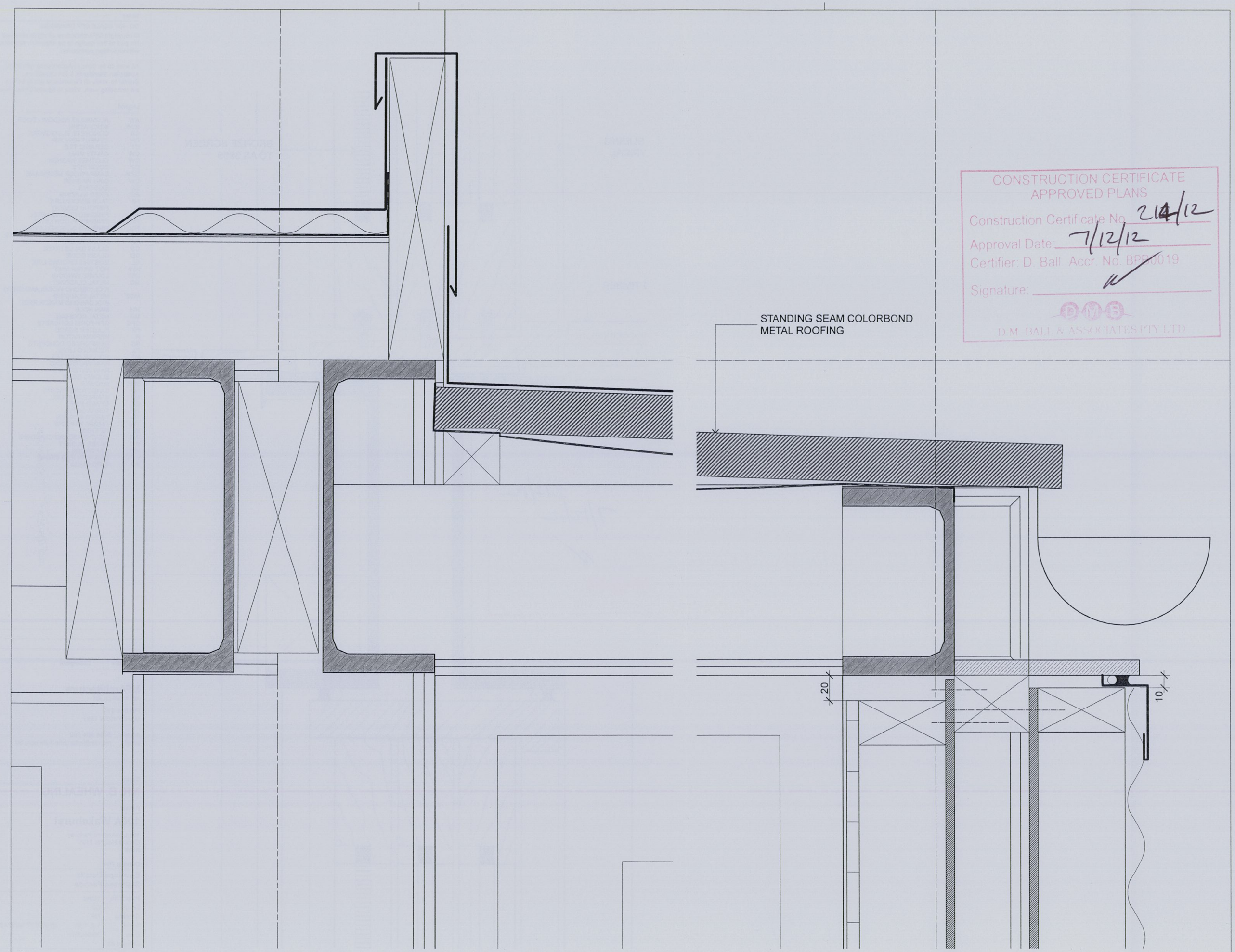
Client
MR. B. WHEALING

Project
100A Wakehurst

100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
Envelope Details
Box Gutter Details

Project No	10008
Drawn	DS
Checked	MF
Scale	1:2, 1:50 @ SHEET SIZE A2
Date	29/04/2011
Drawing No	A-520-006
Phase	FOR CONSTRUCTION CERT.



1 Roof Stair Section
1:2

Notes

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Legend

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CW	CAVITY WALL
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SP	SEWER PIPE
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TS	TIMBER SCREEN
TW	TIMBER WINDOW
W	WINDOW
WB	WEATHERBOARD CLADDING
WC	WATER CLOSET
WR	WARDROBE
WRC	WESTERN RED CEDAR
YG	YARD GULLY

Rev. Date Description

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ABN 19 665 321 421

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MANLY NSW 1655

mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

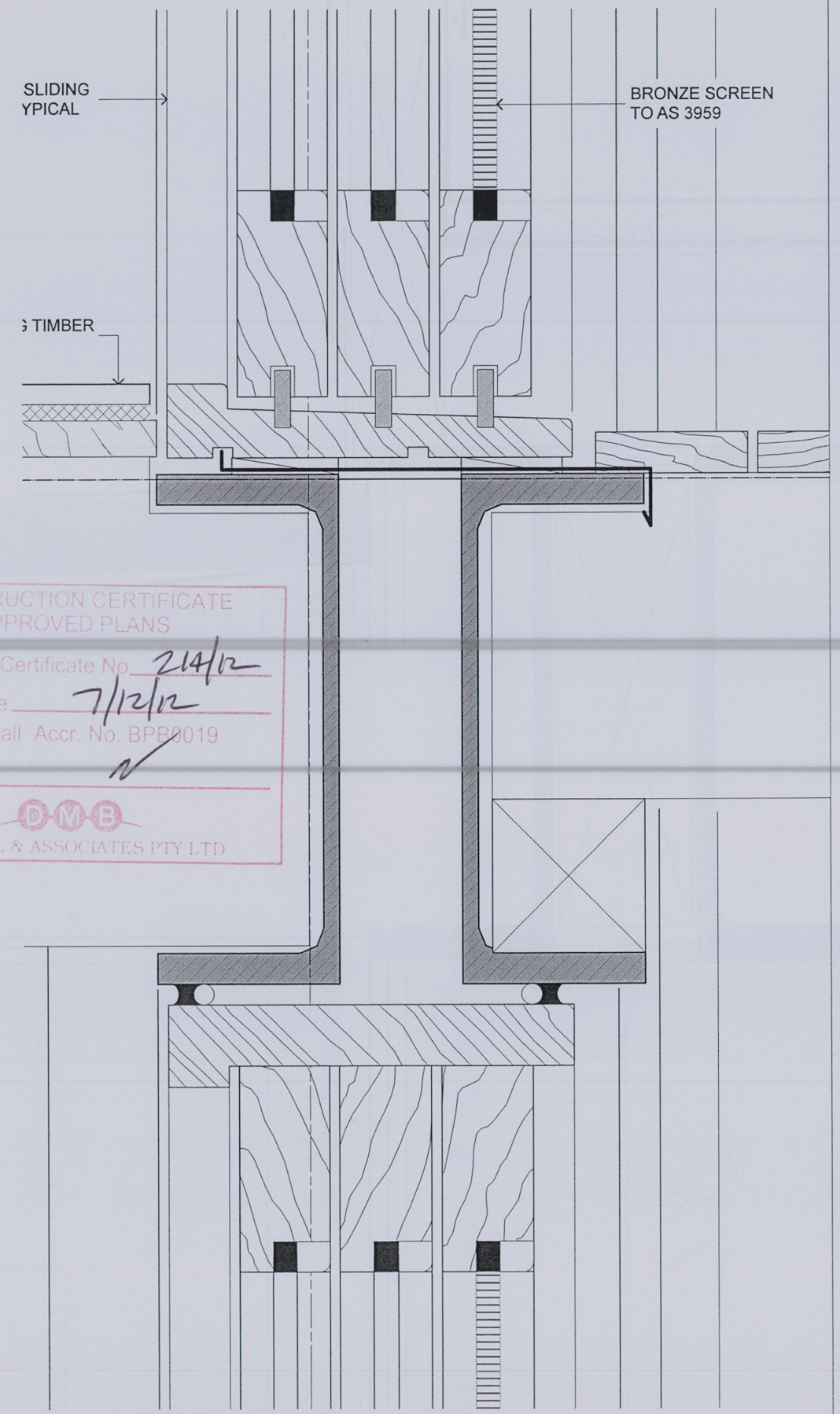
Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
Envelope Details
Staircase Roof Section

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:2, 1:50	@ SHEET SIZE A2
Date	29/04/2011	

Drawing No
A-520-007

Phase
FOR CONSTRUCTION CERT.



1 Staircase Facade Cross
1:2

CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No 214/12
Approval Date 7/12/12
Certifier: D. Ball Accr. No. BPB2019
Signature:
D.M. BALL & ASSOCIATES PTY LTD

Notes

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Legend

AW	ALUMINIUM WINDOW - DOOR
BWK	BRICKWORK
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TW	TIMBER WINDOW
W	WINDOW
WB	WEATHERBOARD CLADDING
WC	WATER CLOSET
WR	WARDROBE
WRC	WESTERN RED CEDAR
YG	YARD GULLY

Rev.	Date	Description

MFArchitecture
ABN 19 665 321 421

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MANLY NSW 1655

mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

Project
100A Wakehurst

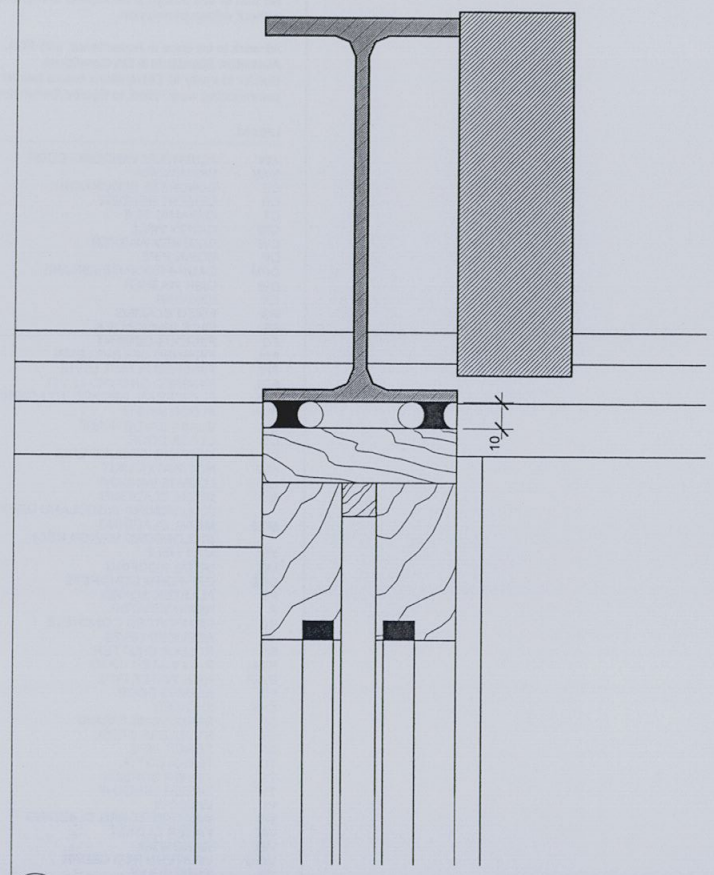
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
Envelope Details
Staircase Facade

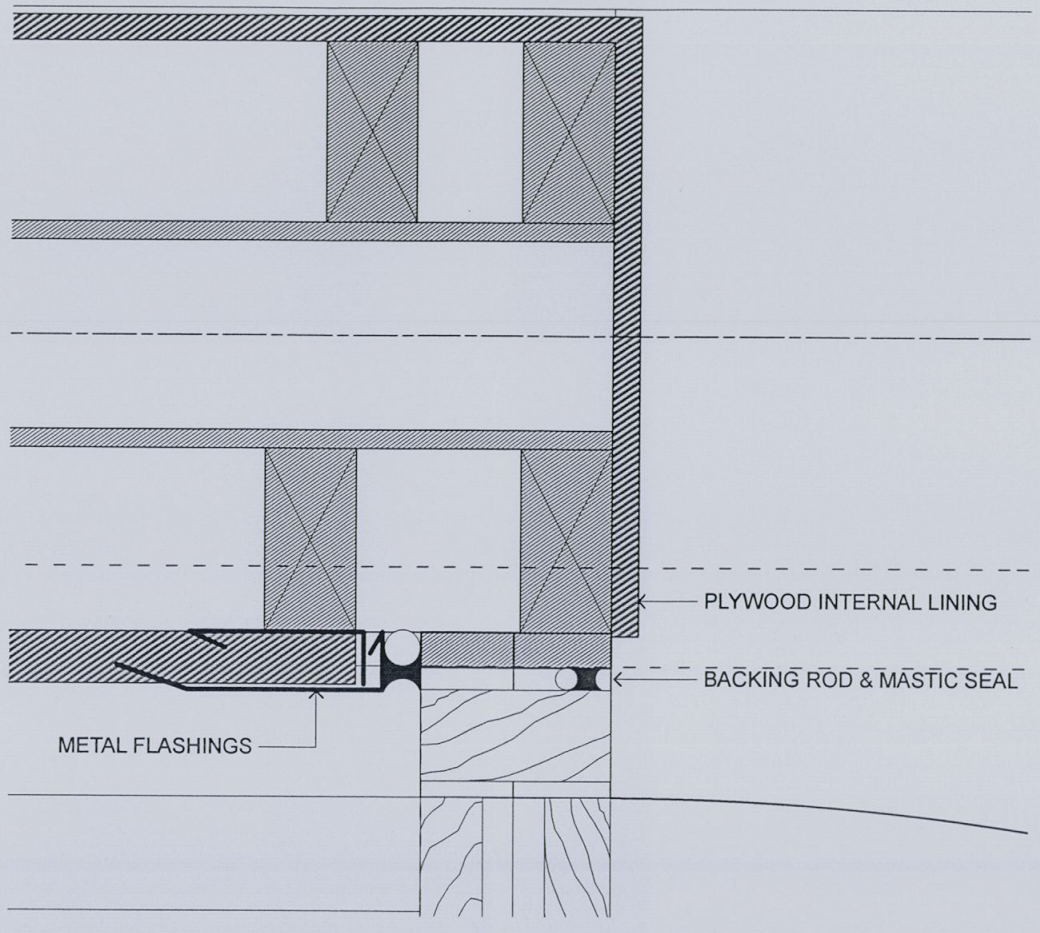
Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:2, 1:50	@ SHEET SIZE A2
Date	29/04/2011	

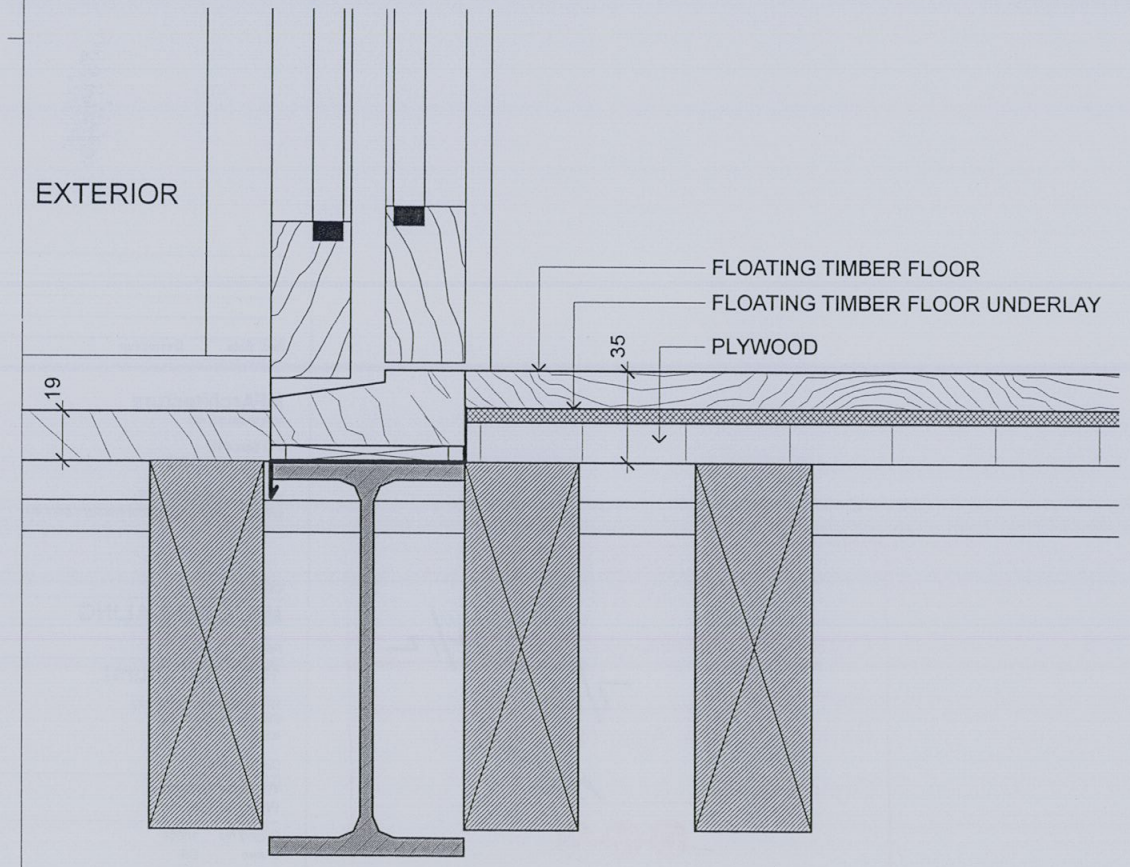
Drawing No
A-520-008

Phase
FOR CONSTRUCTION CERT.

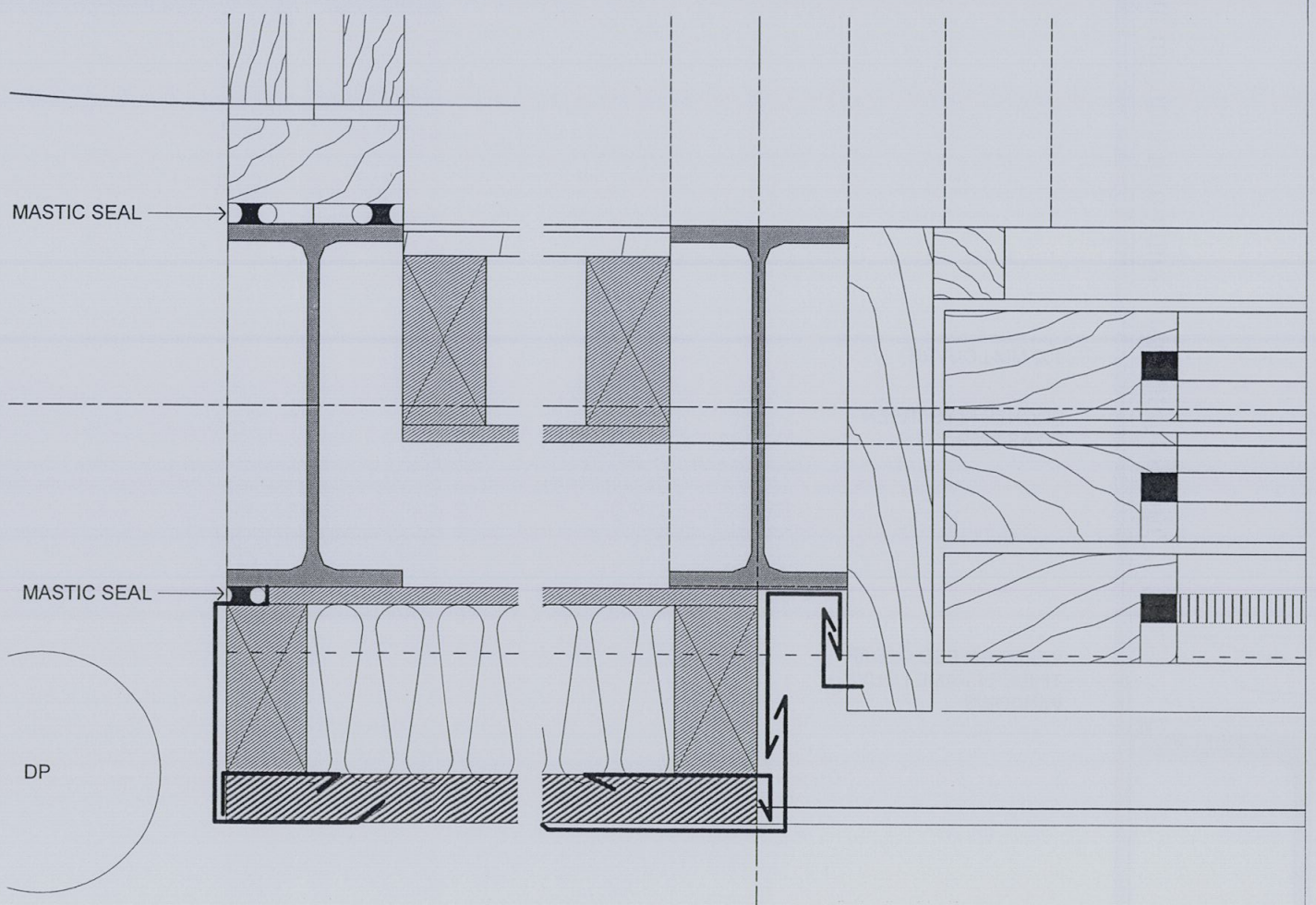


1 Entrance Door Top
1:2





2 Entrance Door Bottom
1:2



3 Entrance Door Plan
1:2

4 Staircase Door Plan
1:2

9:23 PM : 3/05/11 : Macintosh HD:Users:Shared:spatialresponse.net:MFA:100A wakehurst:cad:100A wakehurst AC14.pln

Notes

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Legend

AW	ALUMINIUM WINDOW - DOOR
BWK	BRICKWORK
CB	CONCRETE BLOCKWORK
CR	CEMENT RENDER
CT	CERAMIC TILE
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CW	CLOTHES WASHER
DP	DOWN PIPE
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Rev.	Date	Description

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ABN 19 665 321 421

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Client
MR. B. WHEALING

Project
100A Wakehurst

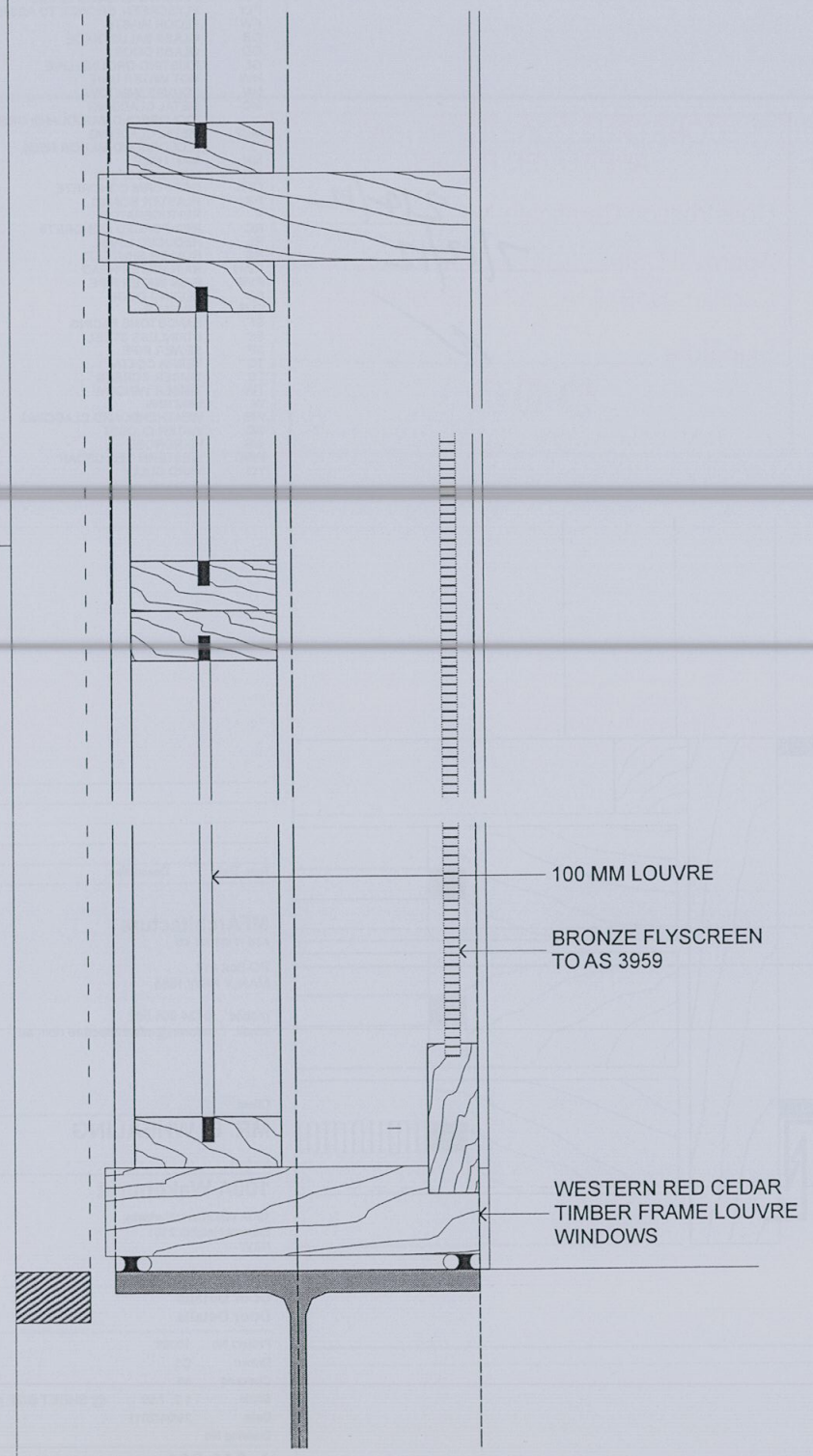
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
Door Details
Door Details

Project No	10008
Drawn	DS
Checked	MF
Scale	1:2, 1:50 @ SHEET SIZE A2
Date	29/04/2011
Drawing No	

A-541-001

Phase
FOR CONSTRUCTION CERT.



1 Roof Window Plan
1:2

Notes

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Legend

AW	ALUMINIUM WINDOW - DOOR
BWK	BRICKWORK
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Client
MR. B. WHEALING

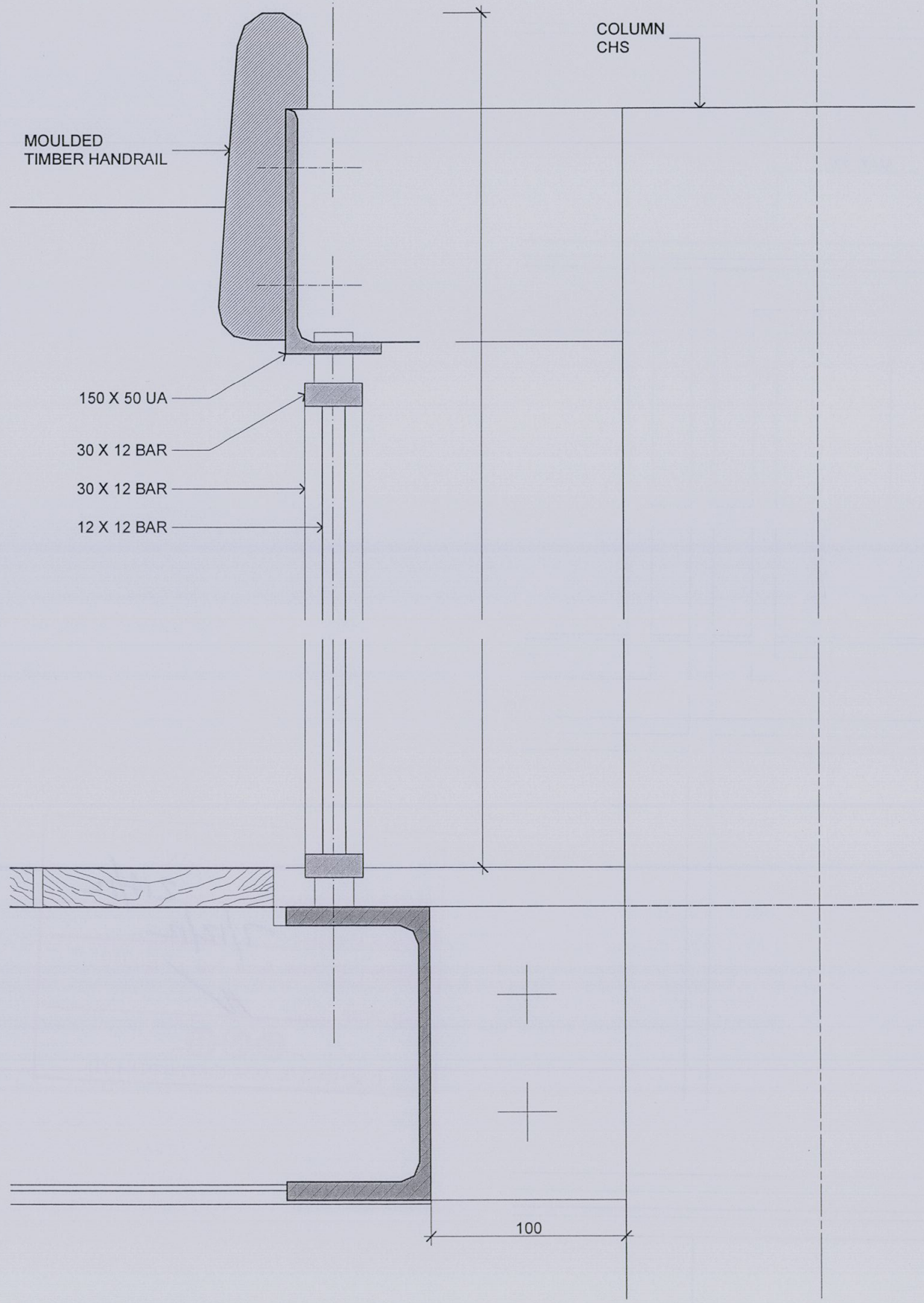
Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
Window Details
Window Details

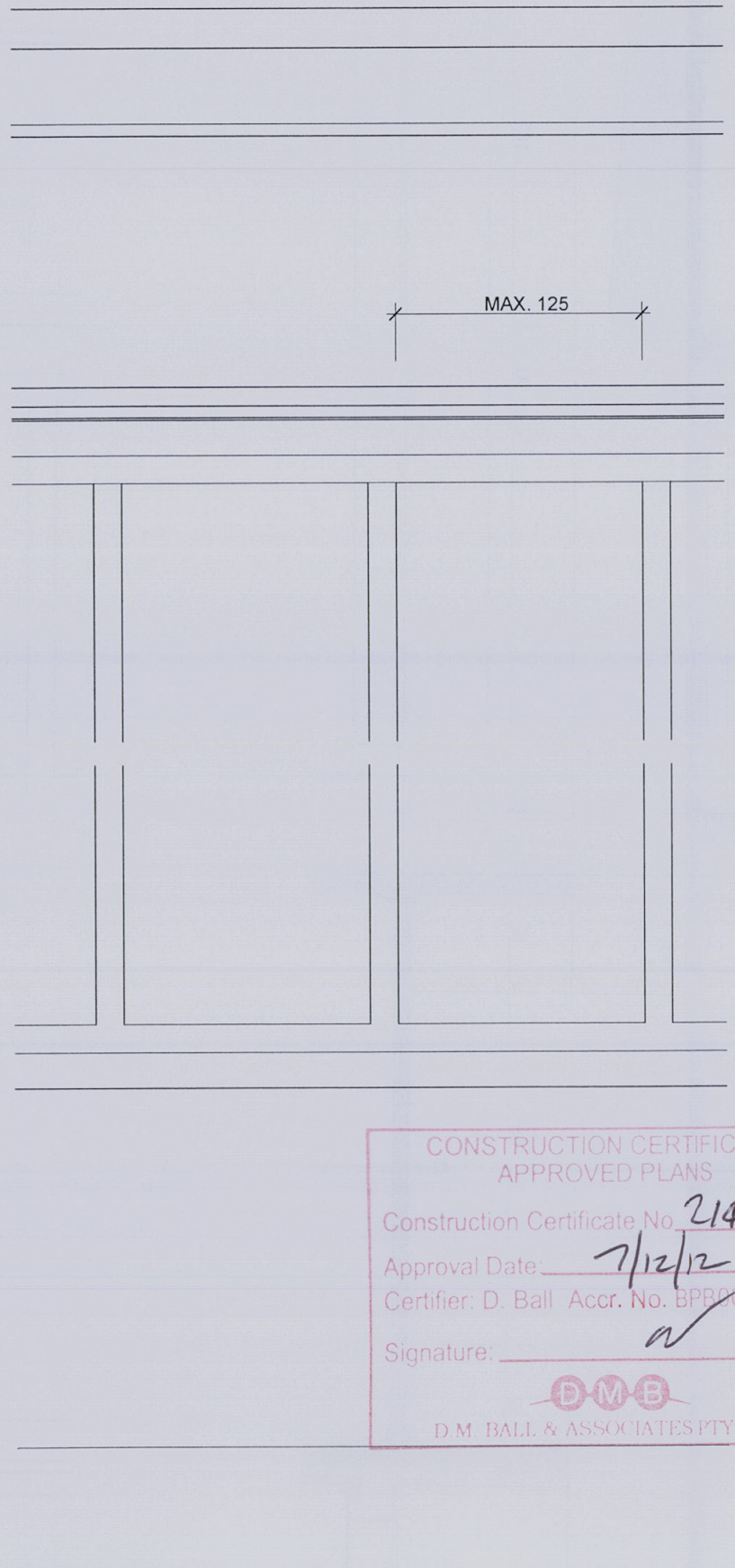
Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:2, 1:50	@ SHEET SIZE A2
Date	29/04/2011	

Drawing No
A-542-001

Phase
FOR CONSTRUCTION CERT.



1 Balustrade Deck Section
1:2



3 Balustrade Deck Elevation
1:2

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DP	DOWN PIPE
DPM	DAMP-PROOF MEMBRANE
DW	DISH WASHER
EX	EXISTING
FG	FIXED GLAZING
FB	FACE BRICKWORK
FC	FIBROUS CEMENT
FCL	FINISHED CEILING LEVEL
FFL	FINISHED FLOOR LEVEL
FGL	FINISHED GROUND LEVEL
FLY	FLYSCREEN, BRONZE TO AS3959
FW	FLOOR WASTE
GB	GLASS BALUSTRADE
GD	GLASS DOOR
GL	EXISTING GROUND LINE
HW	HOT WATER UNIT
LW	LOUVRE WINDOW
MC	METAL CLADDING (COLORBOND WOODLAND GREY)
MC2	METAL CLADDING (COLORBOND MANOR RED)
MH	MAN HOLE
MR	METAL ROOFING
OFC	OFF-FORM CONCRETE
PB	PLASTER BOARD
R	REFRIGERATOR
RC	REINFORCED CONCRETE
RL	REDUCED LEVEL
RS	ROLLER SHUTTER
RWH	RAIN WATER HEAD
RWP	RAIN WATER PIPE
SD	SLIDING DOOR
SHR	SHOWER
SF	SANDSTONE FACING
SS	STAINLESS STEEL
SP	SEWER PIPE
TC	TERRA COTTA
TS	TIMBER SCREEN
TW	TIMBER WINDOW
W	WINDOW
WB	WEATHERBOARD CLADDING
WC	WATER CLOSET
WR	WARDROBE
WRC	WESTERN RED CEDAR
YG	YARD GULLY

Rev. Date Description

MFArchitecture
ABN 19 665 321 421

PO Box 417
MANLY NSW 1655

mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
Balustrade Details
Balustrade Detail Deck

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:2, 1:50	@ SHEET SIZE A2
Date	29/04/2011	

Drawing No
A-546-001

Phase
FOR CONSTRUCTION CERT.

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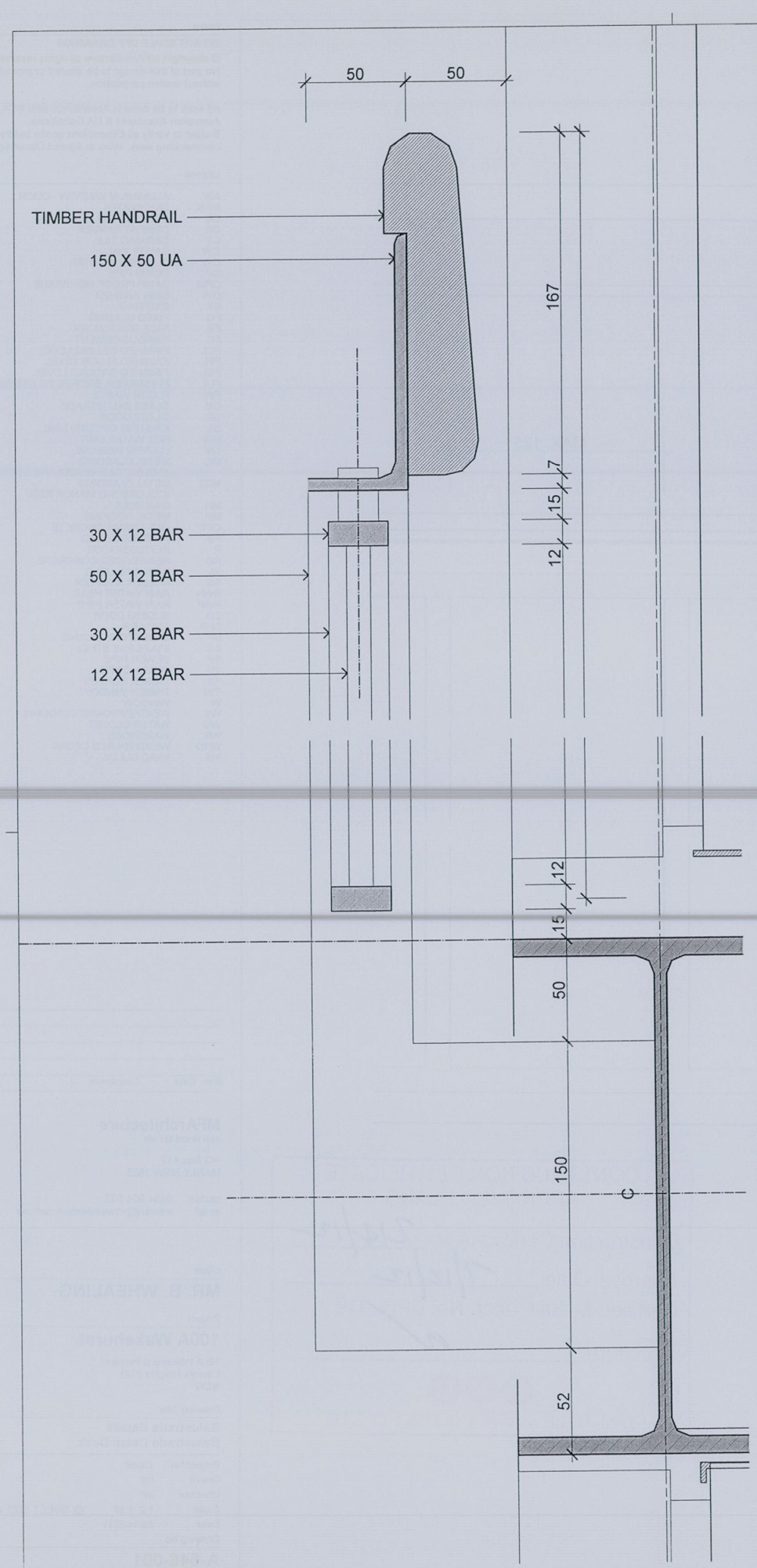
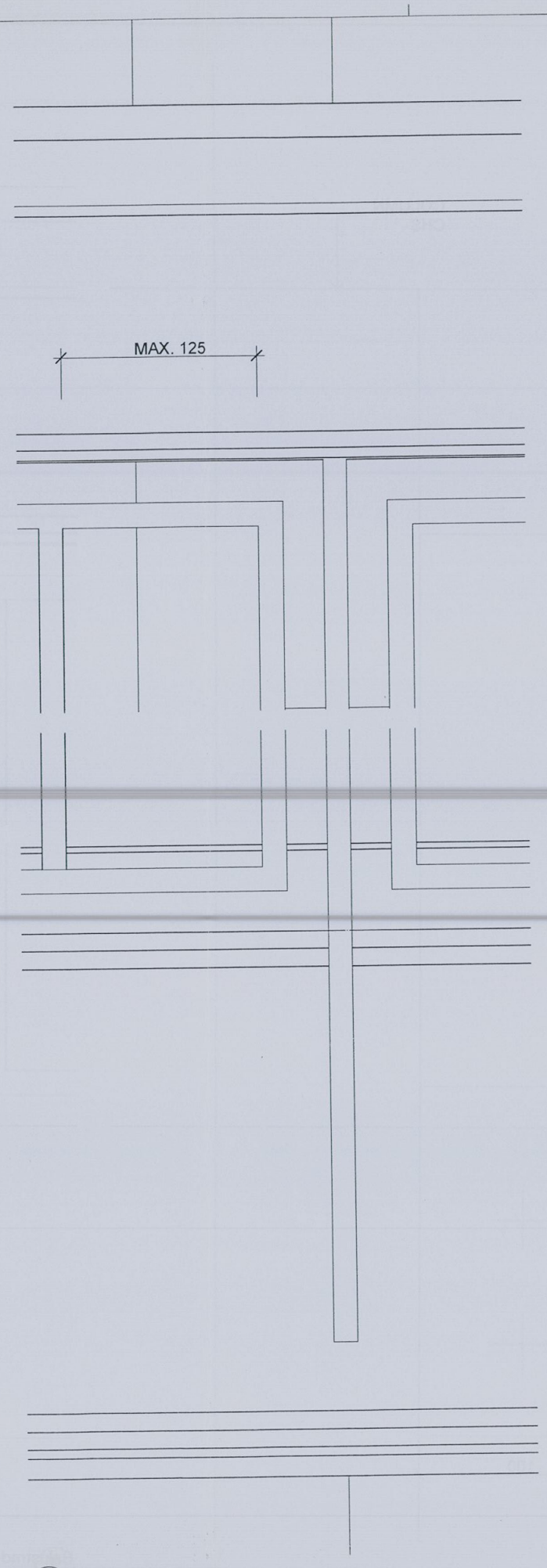


1 Balustrade Front Section
1:2



3 Balustrade Front Elevation
1:2

Notes

DO NOT SCALE OFF DRAWINGS

All work to be done in Accordance with BCA, Australian Standards & DA Conditions.
Builder to verify all Dimensions onsite before commencing work. Work to figured Dimensions only.

Legend

AW	ALUMINIUM WINDOW - DOOR
BWK	BRICKWORK
CB	CONCRETE BLOCKWORK
CR	CEMENT RENDER
CT	CERAMIC TILE
CW	CAVITY WALL
CW	CLOTHES WASHER
DP	DOWN PIPE
DPM	DAMP-PROOF MEMBRANE
DW	DISH WASHER
EX	EXISTING
FG	FIXED GLAZING
FB	FACE BRICKWORK
FC	FIBROUS CEMENT
FCL	FINISHED CEILING LEVEL
FFL	FINISHED FLOOR LEVEL
FGL	FINISHED GROUND LEVEL
FLY	FLYSCREEN, BRONZE TO AS3959
FW	FLOOR WASTE
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MC	METAL CLADDING (COLORBOND WOODLAND GREY)
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PB	PLASTER BOARD
R	REFRIGERATOR
RC	REINFORCED CONCRETE
RL	REDUCED LEVEL
RS	ROLLER SHUTTER
RWH	RAIN WATER HEAD
RWP	RAIN WATER PIPE
SD	SLIDING DOOR
SHR	SHOWER
SF	SANDSTONE FACING
SS	STAINLESS STEEL
SP	SEWER PIPE
TC	TERRA COTTA
TS	TIMBER SCREEN
TW	TIMBER WINDOW
W	WINDOW
WB	WEATHERBOARD CLADDING
WC	WATER CLOSET
WR	WARDROBE
WRC	WESTERN RED CEDAR
YG	YARD GULLY

CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No. 214/12
Approval Date: 7/12/12
Certifier: D. Ball Accr. No. BPB0019
Signature:
D.M. BALL & ASSOCIATES PTY LTD

Rev.	Date	Description

MFArchitecture
ABN 19 665 321 421

PO Box 417
MANLY NSW 1655

mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

Project
100A Wakehurst

100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
Balustrade Details
Balustrade Detail Front

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:2, 1:50	@ SHEET SIZE A2
Date	29/04/2011	

Drawing No
A-546-002

Phase
FOR CONSTRUCTION CERT.

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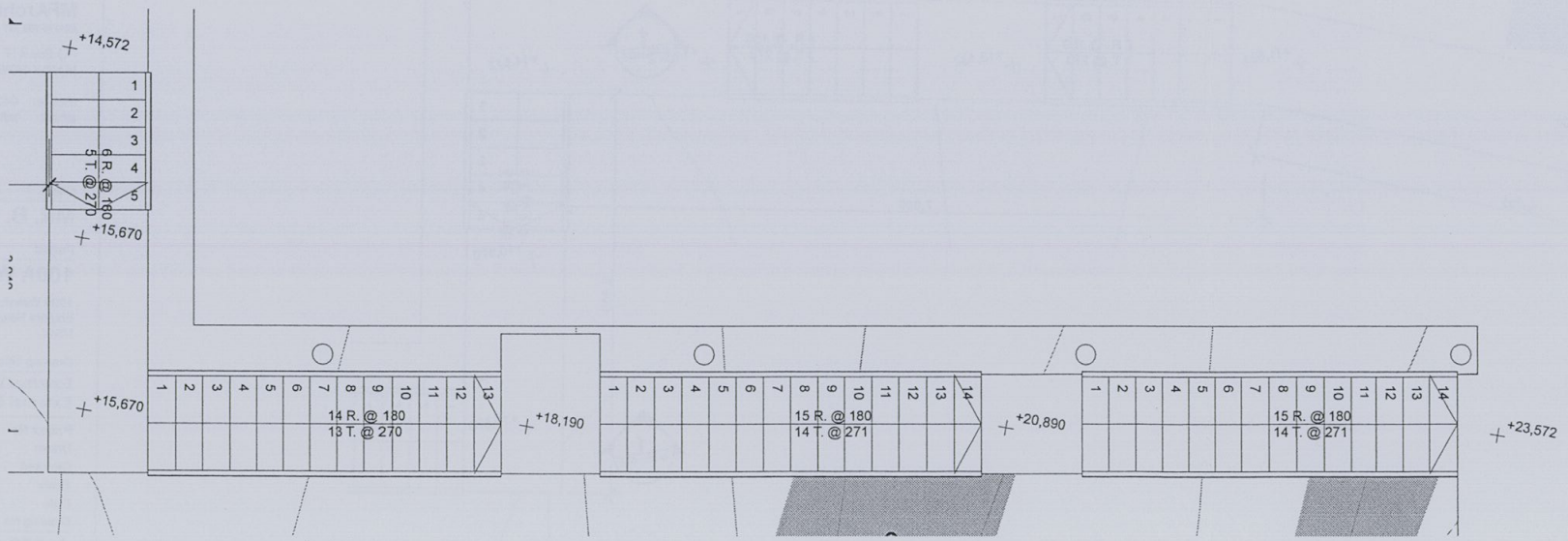
2 Ext. Stair East Elevation
1:50



1 Boardwalk & Stairs North
1:50

CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No. 214/12
Approval Date: 7/12/12
Certifier: D. Ball Accr. No. BPB0019
Signature:
D M BALL & ASSOCIATES PTY LTD

Notes
DO NOT SCALE OFF DRAWINGS

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Builder to verify all Dimensions onsite before commencing work. Work to figured Dimensions only.

Rev. Date Description

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PO Box 417
MANLY NSW 1655

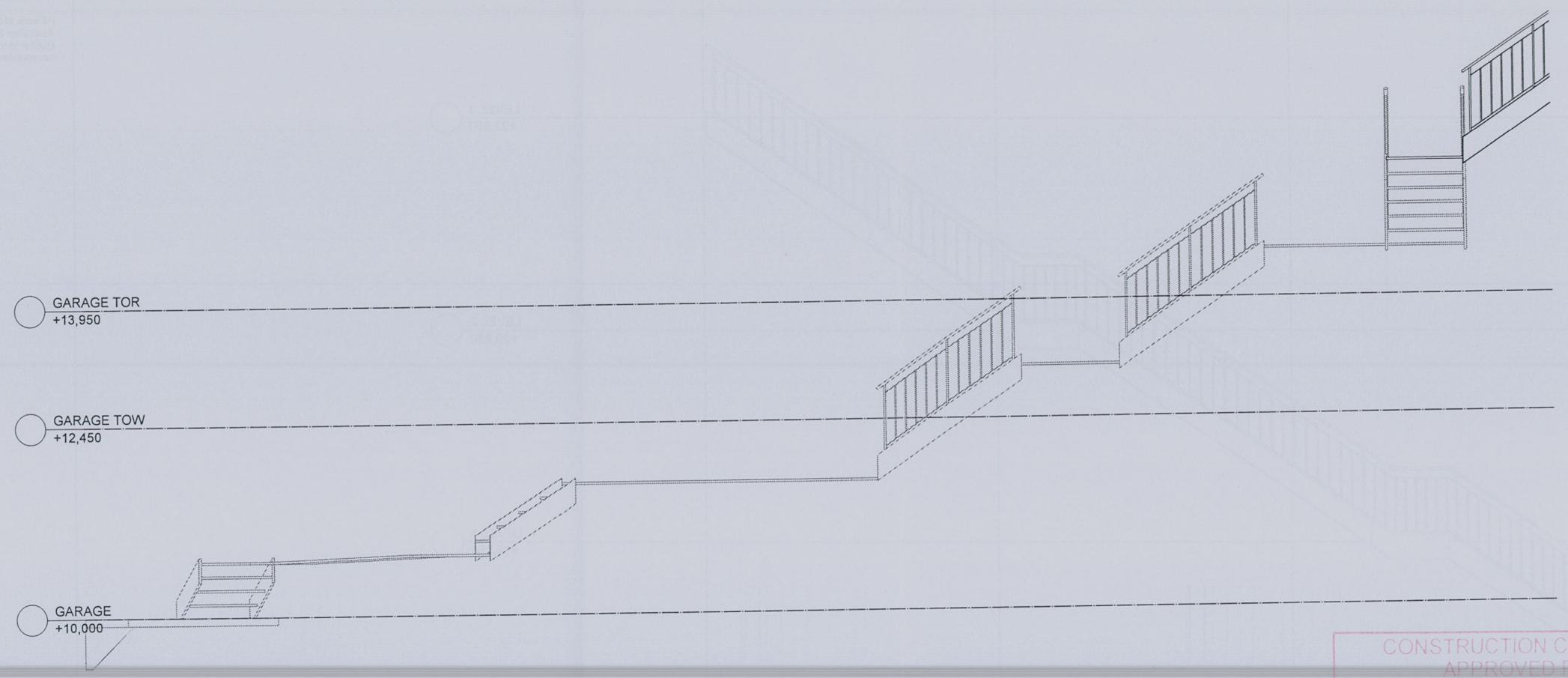
mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

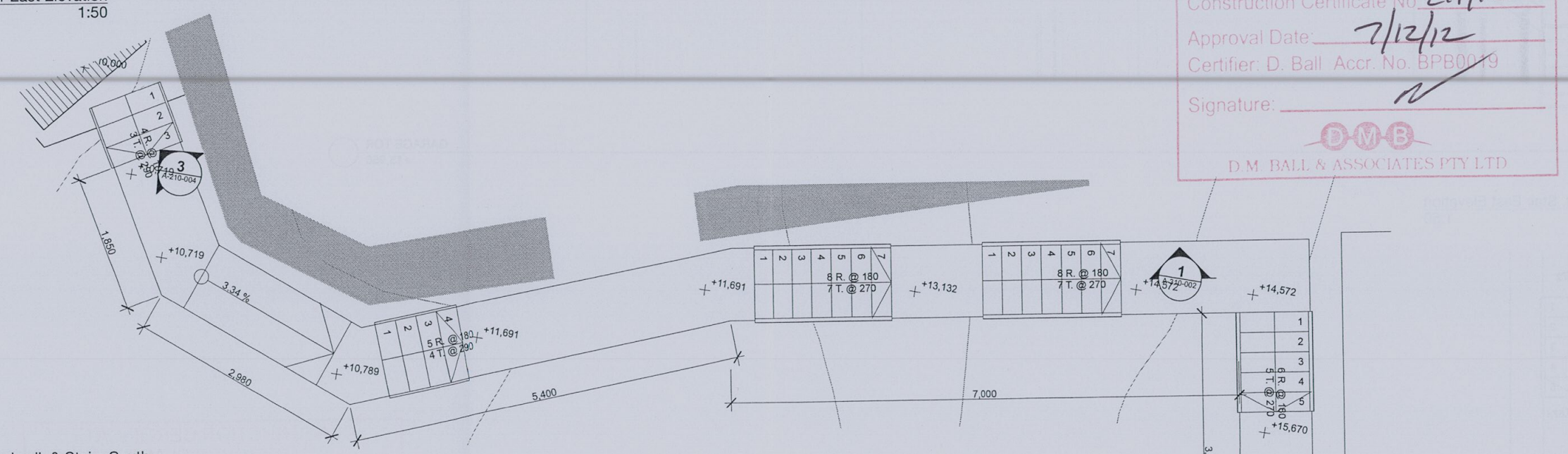
Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
External Works Details
External Staircase North

Project No 10008
Drawn DS
Checked MF
Scale 1:50 @ SHEET SIZE A2
Date 29/04/2011
Drawing No
A-570-001
Phase
FOR CONSTRUCTION CERT.



2 Ext. Stair East Elevation
1:50



1 Boardwalk & Stairs South
1:50

Notes

DO NOT SCALE OFF DRAWINGS

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Builder to verify all Dimensions onsite before commencing work. Work to figured Dimensions only.

CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No. 214/12
Approval Date 7/12/12
Certifier: D. Ball Accr. No. BPB0019
Signature:
D.M. BALL & ASSOCIATES PTY LTD

Rev.	Date	Description

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mobile: 0434 904 582
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Client
MR. B. WHEALING

Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
External Works Details
External Staircase South

Project No	10008	
Drawn	DS	
Checked	MF	
Scale	1:50	@ SHEET SIZE A2
Date	29/04/2011	

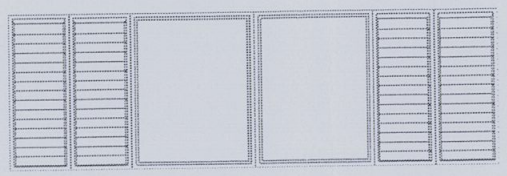
Drawing No
A-570-002

Phase
FOR CONSTRUCTION CERT.

9:23 PM : 3/05/11 : Macintosh HD:Users:Shared:spatialresponse.net:MFA:100A wakehurst:cad:100A wakehurst AC14.pln

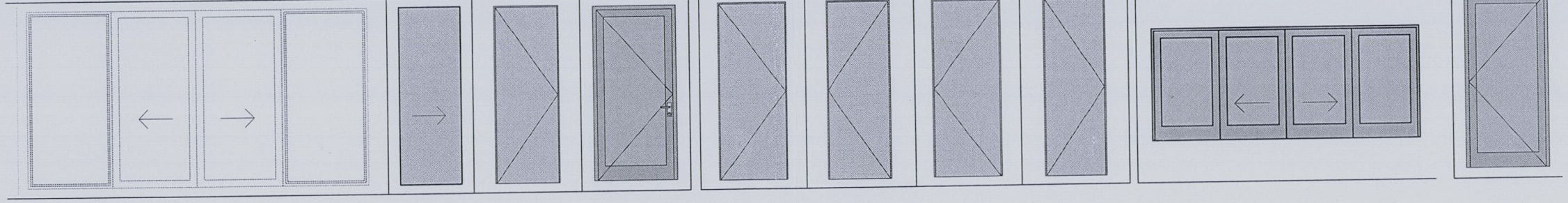
Window List

ID	W1.01	W1.03	W1.04	W2.05	W2.06	WR.03	WR.03
Height	2,450	1,550	2,400	773	2,450	1,480	1,480
Width	1,187	316	904	870	1,161	593	1,187
Orientation	R	R	L	R	R	L	L
Window sill height	-40	900	0	900	0	0	0
Window head hei...	2,410	2,450	2,400	1,673	2,450	1,480	1,480
2D Symbol							
3D Front View							



Door List

ID	D1.01	D1.02	D1.03	D1.04	D2.02	D2.03	D2.06	D2.07	D2.05	D3.03
Quantity	1	1	1	1	1	1	1	1	1	1
W x H Size	2,374x2,450	860x2,450	900x2,450	1,148x2,410	956x2,450	820x2,450	956x2,450	820x2,450	3,725x1,550	1,148x2,410
Orientation		L	L	L	L	R	R	L		R
Door head height	2,410	2,450	2,450	2,410	2,450	2,450	2,450	2,450	2,450	2,410
2D Symbol										
3D Front View										



CONSTRUCTION CERTIFICATE
APPROVED PLANS
Construction Certificate No. 214/12
Approval Date 7/12/12
Certifier: D. Ball Accr. No. BPB0019
Signature:
D M B
B&M BALL & ASSOCIATES PTY LTD

Timber Windows & Doors in accordance with
BASIX Requirements & AS3959 Bushfire Standard - L1 Construction.

All Windows & Doors to be measured on site before manufacture.

Notes
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Builder to verify all Dimensions onsite before commencing work. Work to figured Dimensions only.

Rev.	Date	Description

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ABN 19 665 321 421

PO Box 417
MANLY NSW 1655

mobile: 0434 904 582
email: mforan@mfarchitecture.com.au

Client
MR. B. WHEALING

Project
100A Wakehurst
100A Wakehurst Parkway
Elanora Heights 2101
NSW

Drawing Title
Door & Window Schedules
Door & Window Schedule

Project No	10008
Drawn	DS
Checked	MF
Scale	1:1, 1:50 @ SHEET SIZE A2
Date	29/04/2011
Drawing No	A-641-001
Phase	FOR CONSTRUCTION CERT.

NEW RESIDENCE
At 100A WAKEHURST PARKWAY, ELANORA HEIGHTS
For MR B. WHEALING

STRUCTURAL DRAWINGS

CONSTRUCTION NOTES

GENERAL

G1 This drawing shall be read in conjunction with all other working drawings and specifications and with such other written instructions as may be issued during the course of construction. All discrepancies and variations shall be referred to the Engineer before proceeding with the work.
G2 All work shall be in accordance with the requirements of all relevant and current SAA Codes.
G3 All dimensions relevant to setting out and off–site work shall be verified before construction and fabrication is commenced.
G4 Dimensions shall not be obtained by scaling the structural drawings.
G5 During construction the structure shall be maintained in a stable condition and no part of the structure shall be overstressed.
G6 The structural elements shown on these drawings have been designed for the following superimposed loads : Deck live load = 3.0 kPa
Internal floor load = 1.5 kPa
Wind Classification = N2

CONCRETE

C1 All workmanship and materials shall be in accordance with current editions of AS3600 except as varied by contract documents.
C2 Cement shall be Type "A" unless specified otherwise. Concrete components and quality shall be as follows:

Structural Element	F'c MPa	Slump mm	Aggr. size	Density (kg/m3)
Footings, levelling strips	25	100	20	2400
Slab on ground	32	100	20	2400
Suspended slab	40	100	20	2400
Beams, columns, and walls	40	100	20	2400

C3 Clear concrete cover to reinforcement unless shown otherwise shall be:

Element	Formed Not exposed	Formed exposed soil or rain	Poured against membrane
Slabs	30	40	30
Walls	30	40	n/a
Beams	40	50	n/a
Columns	40	50	n/a
Pedestals	50	50	n/a
Footings	50	65	40

C4 Construction joints shall be properly formed and used only where shown or specifically approved by the Engineer.
C5 No holes, chases or embedment of pipes , other than those shown on the structural drawings , shall be made without the written prior approval of the Engineer.
C6 Splices in reinforcement shall be made only in the positions shown on the Structural drawings, or as otherwise approved by the Engineer.

CONCRETE

C7 Lapped fabric splices shall be so made that the overlap, measured between the outermost wires of each sheet of fabric, is not less than the wire spacing plus 25mm.
C8 Reinforcement is shown diagrammatically, it is not necessarily shown in true projection.
C9 All reinforcement fabric shall be to AS1304
All reinforcement bars shall be to AS1302.
Symbols: F: wire reinforcing fabric.
W: Grade 450 deformed wire
S: Grade 200 deformed bar
N: Grade 500 deformed bar.
Example of designation code for reinforciong bars :–
No of bars in group ¬ ┌———— bar grade and type
17N20–350
nominal bar size in mm ┘ └— spacing in mm.
UNO stands for unless noted otherwise".
C10 Where transverse tie bars are not shown, provide Y12–400. Splice where necessary and lap with main bars for 400mm.
C11 All concrete shall be placed and "cured" in accordance with AS3600. Where curing compound is used it must applied (a) onto slabs within 2 hours of finishing the concrete surface, (b) onto walls and columns immediately after removal of formwork.
C12 Horizontal formwork shall be stripped when approved by the Engineer.
C13 Slabs and beams shall bear only onto the beams, walls and other types of support as shown on the structural drawings. All other building elements shall be kept 15mm clear from soffits of structure.
C14 During concrete placing the builder shall have on site rain protecting plastic sheeting and supports to keep it clear of wet concrete, and also aliphatic alcohol sprays to prevent plastic cracking in hot or windy conditions.

MASONRY

M1 Where slabs or beams bear on masonry, the top course shall be level, smooth and covered with two layers of three–ply malthoid unless noted otherwise.
M2 Masonry walls shall not be erected on suspended slabs or beams until all propping has been removed.
M3 Bricks used in load bearing construction shall have a minimum compressive strength of 20 MPa unless otherwise noted.
M4 All masonry shall comply with AS3700 and Australian Standards referenced within AS3700.
M5 Masonry shall be articulated where required by AS2870 to satisfy footing design selections.

EPOXY AND MECHANICAL ANCHORS

A1 After drilling holes for epoxy and mechanical anchors, remove all debris from hole using a combination of 'bottle' type stiff brushes and air pumps as specified by manufacturer.

BLOCKWORK

B1 Blockwork shall be in accordance with AS2733
B2 Concrete in base shall be Grade 20
B3 Reinforcement symbol S requires bars as Note C9
B4 Construct retaining walls with double–U blocks
B5 Blocks shall be Grade 12 to AS2733
B6 Clean out openings shall be used in all cores and cleaned out before grout filling.
B7 Use recessed blocks for horizontal bars.
B8 Grout shall be Grade 20 with 10mm aggregate and 230 slump
B9 All cores shall be filled with grout
B10 All mortar shall be 1 part cement to 1/2 part lime and 4–1/2 parts sand. (1 : 0.5 : 4.5)
B11 Mortar dags and concrete fins shall be removed by rodding and cleaned out before grouting cores.
B12 Where horizontal bars are specified in both faces they shall be in staggered courses.
B13 Where vertical bars are shown lapped, the bar may be in one length to suit double–U blocks in stack bond

STRUCTURAL STEELWORK

S1 All workmanship and materials shall be in accordance with AS4100, AS1554, AS3679 and AS1163 as applicable.
S2 Unless otherwise noted all structural steel shall be Grade 300 (Grade 350 for hollow sections)
S3 All bolts shall be high strength, galvanised.
S4 Provide 25 thick cement mortar pad under steelwork supported on masonry.
S5 Steel sealed from weather shall be painted with primer U.N.O.
S6 Steel party or fully exposed to weather shall be hot dip galvanised to AS 4680 U.N.O.
S7 All welds shall be 6mm continuous fillet all round U.N.O.

TIMBER FRAMING

T1 All workmanship and materials shall be in accordance with AS1684 and AS1720 as applicable.
T2 Use treated timber where required for durability.
T3 Do not use timber unsuitable for exposure to moisture in exposed locations.
T4 Provide structure bracing in accordance with AS1684
T5 Provide structure tie down in accordance with AS1684
T6 Use galvanised fixings where exposed to weather
T7 Design is based on roof material shown on the drawings

FOUNDATIONS

F1 Footings are to bear on competent bedrock with an allowable bearing pressure of 600kPa.
The foundation shall be approved by the Geotechnical Engineer and structural engineer before placing concrete in footings.
F2 Refer to geotechnical report ref. no. 20992ZRrpt, dated 17 April 2007, and geotechnical letter ref 20992ZRlet3, dated 6 December 2012, prepared by JK Geotechnics for all earthworks (e.g. excavations, engineered fill, sub–surface drainage etc.).

DRAWING LIST

D M PAUL & ASSOCIATES PTY LTD
DETAILS NOTED

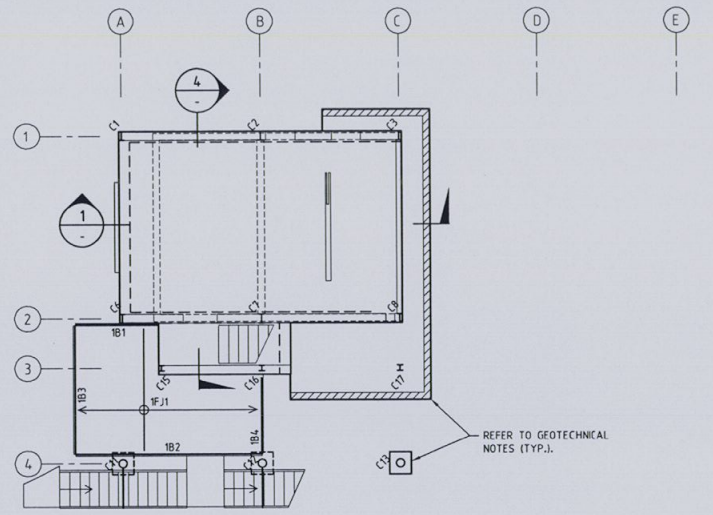
DATE	ISSUE	DESCRIPTION	DATE	ISSUE	DESCRIPTION

PLAN CERTIFICATION
I am a Structural Engineer holding the qualification of BE (Civil) and ME (Structural) and I am appropriately qualified to certify the structural components of this project. I hereby state that these plans and details comply with the conditions of development consent, the provisions of the Building Code of Australia and/or relevant Australian/Industry Standards.

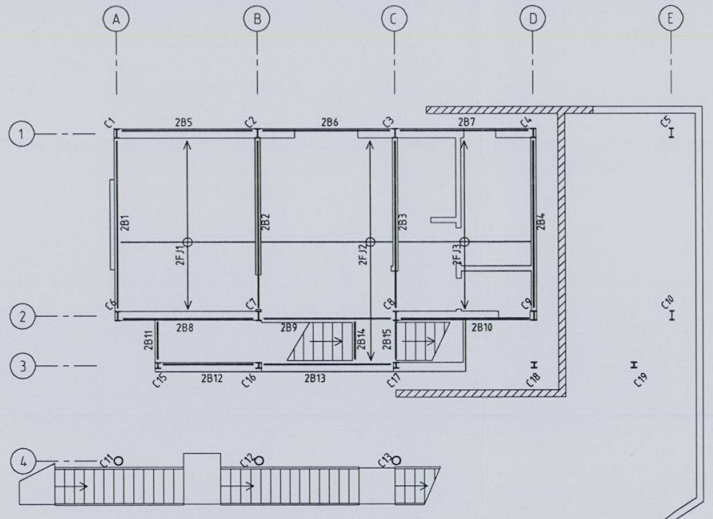
Kyle Docherty BE ME PEng
Docherty Consulting Engineers Pty Ltd

DOCHERTY CONSULTING ENGINEERS
Structural & Civil
Docherty Consulting Engineers Pty Ltd ABN 74 105 101 540 ACN 105 101 540
77 Anzac Ave Collaroy 2097 mob 0418861495 ph 99729812 kyle_docherty@bigpond.com

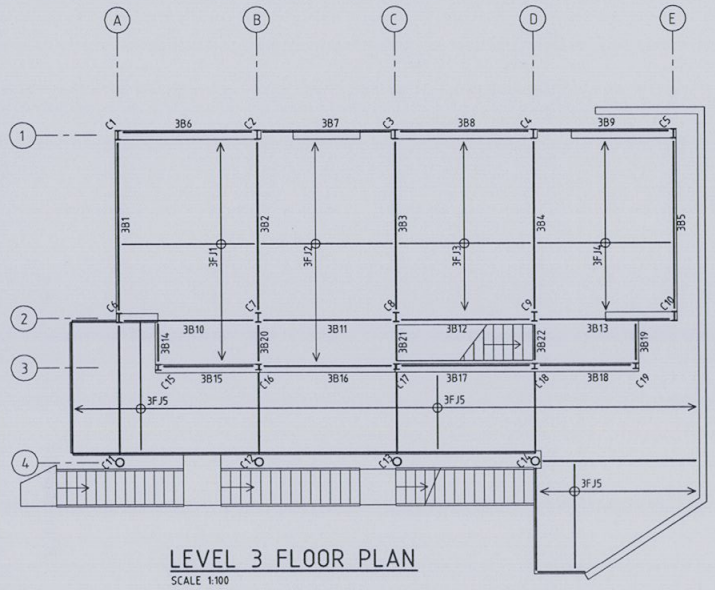
Project	NEW RESIDENCE At 100A WAKEHURST PARKWAY, ELANORA HEIGHTS For MR B. WHEALING	Drawn	KRD	Approved	K R DOCHERTY
		Date	5.12.12	Purpose of Issue	CONSTRUCTION CERT.
Drawing Title	COVER SHEET AND CONSTRUCTION NOTES	Scale	SHOWN	Sheet A1	Project 110104 / Drawing S00 / Rev 0



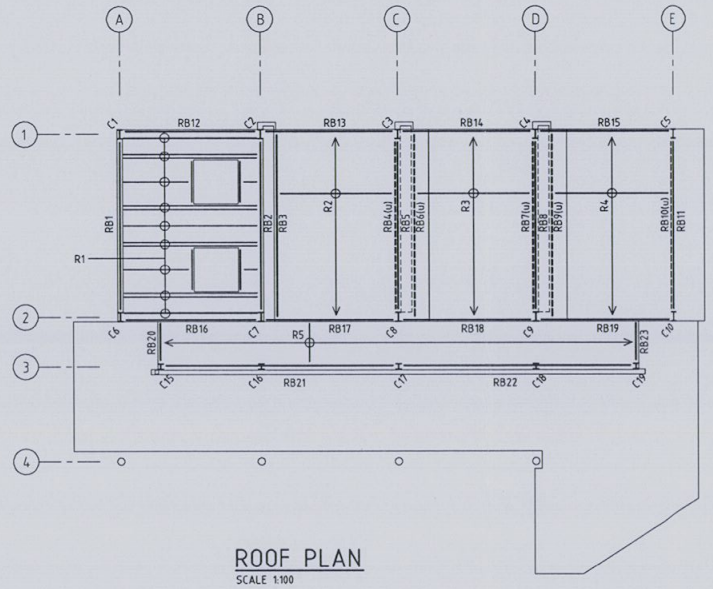
LEVEL 1 FLOOR PLAN
SCALE 1:100



LEVEL 2 FLOOR PLAN
SCALE 1:100



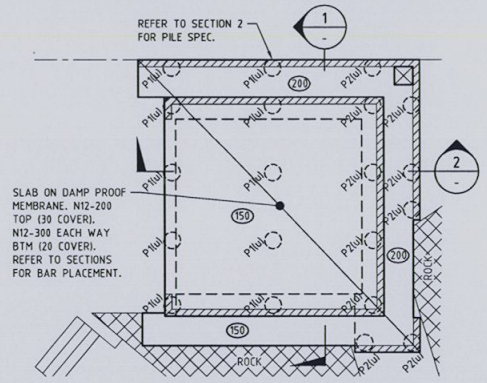
LEVEL 3 FLOOR PLAN
SCALE 1:100



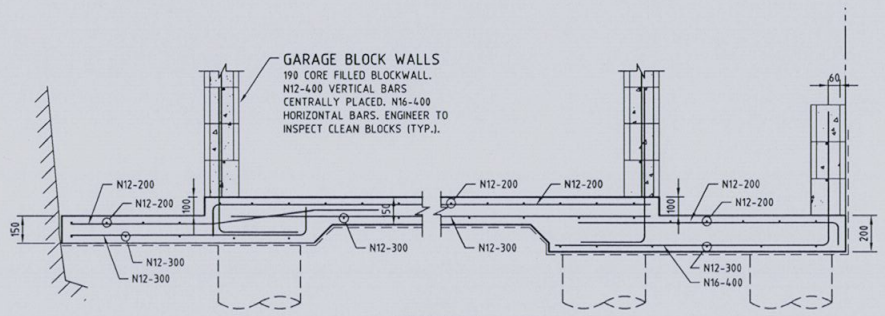
ROOF PLAN
SCALE 1:100

MEMBER SCHEDULE

C1 to C10	250UB31 STEEL COLUMN
C11 to C14	219.1x6.4CHS STEEL COLUMN
C15 to C19	150UC23 STEEL COLUMN
1B1 to 1B4	200PFC STEEL BEAM
2B1 to 2B4	250UB31 STEEL BEAM
2B5 to 2B11	250UB25 STEEL BEAM
2B12 to 2B15	180UB16 STEEL BEAM
3B1 to 3B5	250UB31 STEEL BEAM
3B6 to 3B9	250UB25 STEEL BEAM
3B10 to 3B19	180UB16 STEEL BEAM
1FJ1	190x45 F17 H'WOOD AT 450 CTRS
2FJ1 to 2FJ3	200x45 LVL GRADE 13 AT 450 CTRS
3FJ1 to 3FJ4	200x45 LVL GRADE 13 AT 450 CTRS
3FJ5	190x45 KD F17 H'WOOD AT 450 CTRS
RB1 to RB11	250UB31 STEEL BEAM
RB12 to RB19	250UB25 STEEL BEAM
RB20 to RB23	150x150x8EA STEEL BEAM
R1 to R4	150x45 LVL GRADE 13 AT 600 CTRS
R5	90x45 LVL GRADE 13 AT 600 CTRS



GARAGE FLOOR PLAN
SCALE 1:100



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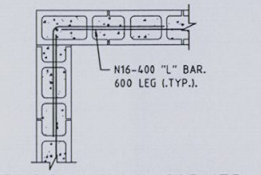
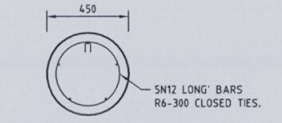
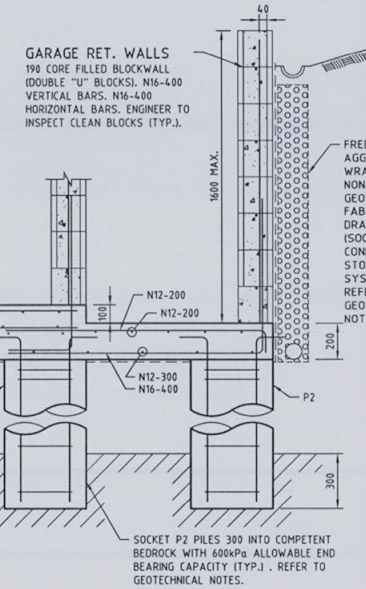


BLOCK WALL CORNER
SCALE 1:20



P2 PILE SECTION
SCALE 1:20



SECTION 2
SCALE = 1:20

GEOTECHNICAL NOTE:

1. GEOTECHNICAL ENGINEER TO CONFIRM STABILITY OF ALL EXCAVATION FACES AND DETAIL TEMPORARY AND/OR PERMANENT SUPPORT MEASURES, AS REQUIRED.
2. ALL FOOTINGS TO BE FOUNDED ON COMPETENT BEDROCK WITH 600kPa ALLOWABLE BEARING CAPACITY.
3. GEOTECHNICAL ENGINEER TO VERIFY BEARING CAPACITY OF ALL FOUNDATIONS PRIOR TO CONCRETE PLACEMENT.
4. GEOTECHNICAL ENGINEER TO INSPECT ALL SUBSURFACE DRAINS PRIOR TO BACKFILLING.
5. ALL EARTHWORKS (e.g. ENGINEERED FILL etc) ARE TO BE IN ACCORDANCE WITH THE GEOTECHNICAL REPORT AND LETTER REFERRED TO IN NOTE 6.
6. THE STRUCTURAL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH GEOTECHNICAL REPORT REF. No.20992ZRrpt, DATED 17 APRIL 2007, AND LETTER 20992ZRlet3, DATED 6 DECEMBER 2012, PREPARED BY JK GEOTECHNICS.

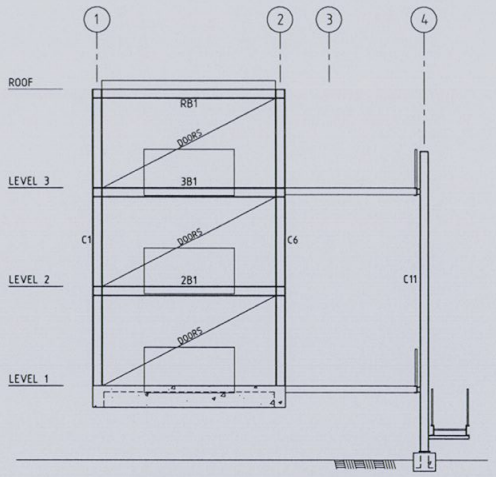
DATE	ISSUE	DESCRIPTION	DATE	ISSUE	DESCRIPTION

PLAN CERTIFICATION
I am a Structural Engineer holding the qualification of BE (Civil) and ME (Structural) and I am appropriately qualified to certify the structural components of this project. I hereby state that these plans and details comply with the conditions of development consent, the provisions of the Building Code of Australia and/or relevant Australian/Industry Standards.

Kyle Docherty BE ME PEng
Docherty Consulting Engineers Pty Ltd

DOCHERTY CONSULTING ENGINEERS
Structural & Civil
Docherty Consulting Engineers Pty Ltd ABN 74 105 101 540 ACN 105 101 540
77 Anzac Ave Collaroy 2097 mob 0418861495 ph 99729812 kyle_docherty@bigpond.com

Project	NEW RESIDENCE At 100A WAKEHURST PARKWAY, ELANORA HEIGHTS For MR B. WHEALING	Drawn	KRD	Approved	K R DOCHERTY
		Date	5.12.12	Purpose of Issue	CONSTRUCTION CERT.
Drawing Title	MARKING PLANS AND CONCRETE DETAILS	Scale	SHOWN	Sheet	A1
		Project	110104	Drawing	S01
		Rev	0		



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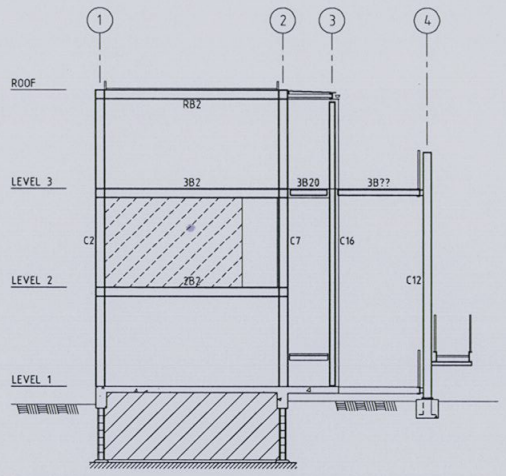

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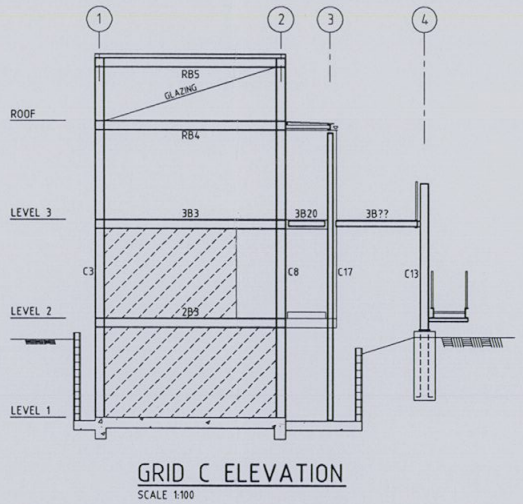

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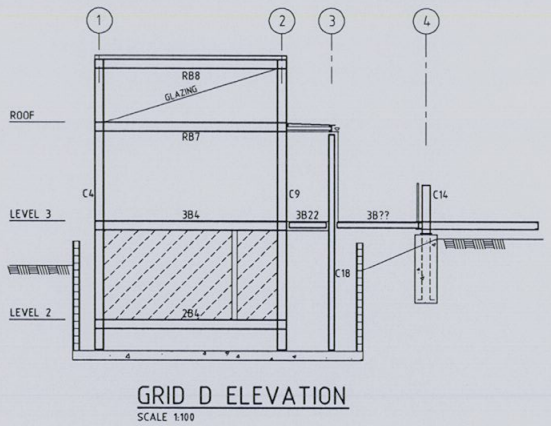

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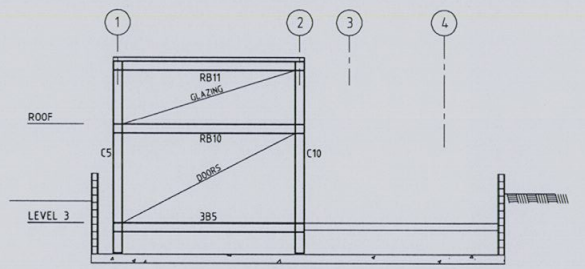

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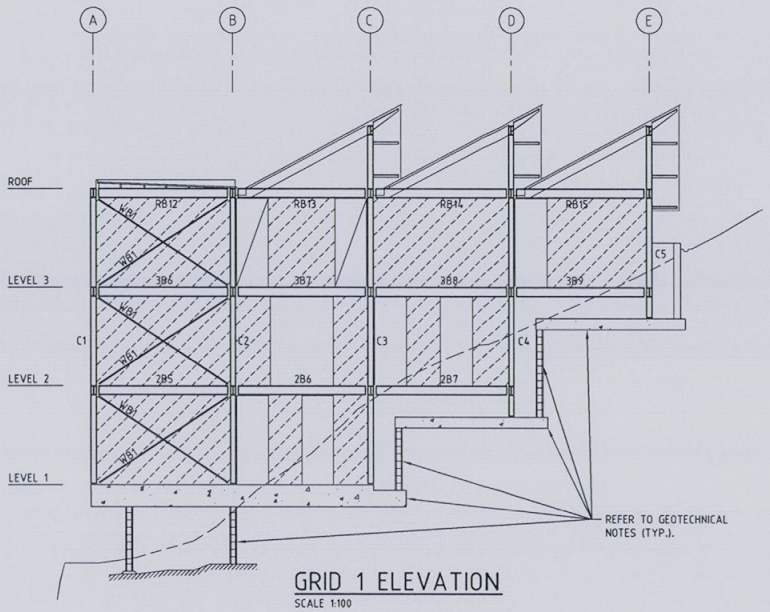

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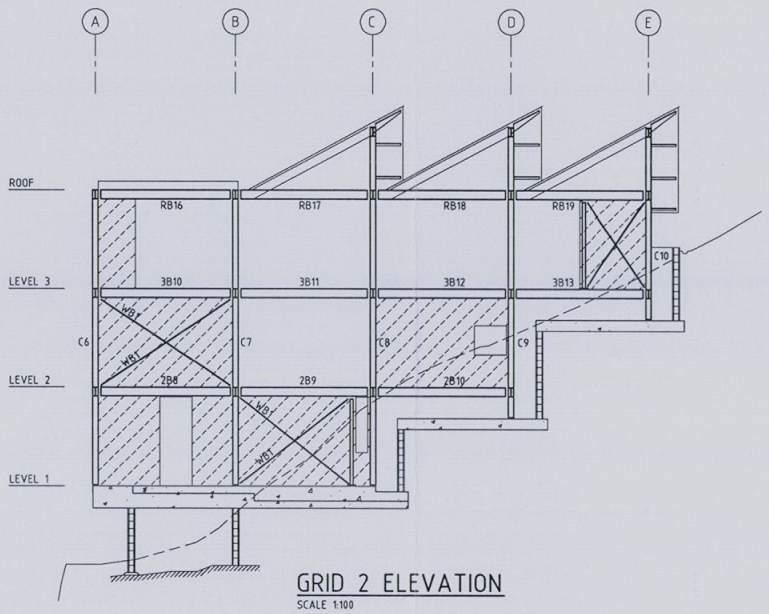

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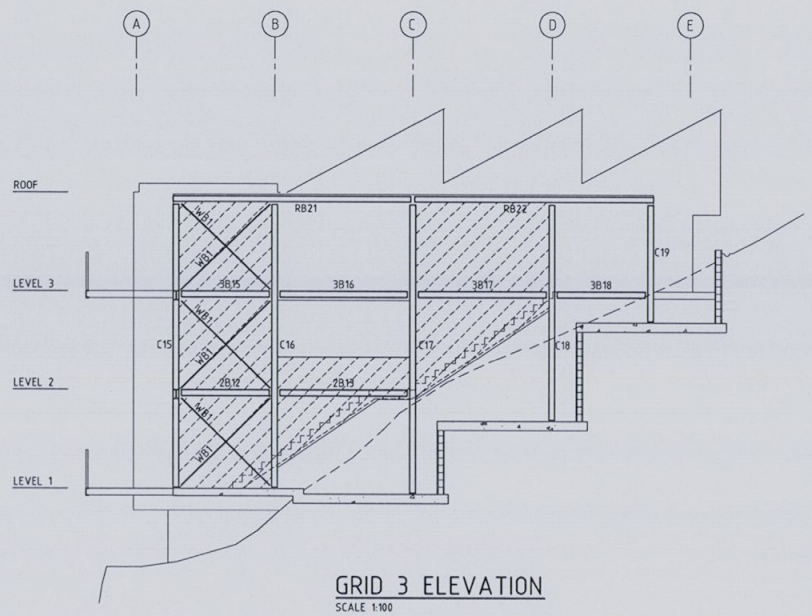

GRID 3 ELEVATION
SCALE 1:100

GEOTECHNICAL NOTE:

1. GEOTECHNICAL ENGINEER TO CONFIRM STABILITY OF ALL EXCAVATION FACES AND DETAIL TEMPORARY AND/OR PERMANENT SUPPORT MEASURES, AS REQUIRED.
2. ALL FOOTINGS TO BE FOUNDED ON COMPETENT BEDROCK WITH 600kPa ALLOWABLE BEARING CAPACITY.
3. GEOTECHNICAL ENGINEER TO VERIFY BEARING CAPACITY OF ALL FOUNDATIONS PRIOR TO CONCRETE PLACEMENT.
4. GEOTECHNICAL ENGINEER TO INSPECT ALL SUBSURFACE DRAINS PRIOR TO BACKFILLING.
5. ALL EARTHWORKS (e.g. ENGINEERED FILL etc) ARE TO BE IN ACCORDANCE WITH THE GEOTECHNICAL REPORT AND LETTER REFERRED TO IN NOTE 6.
6. THE STRUCTURAL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH GEOTECHNICAL REPORT REF. No.20992ZRpt, DATED 17 APRIL 2007, AND LETTER 20992ZRlet3, DATED 6 DECEMBER 2012, PREPARED BY JK GEOTECHNICS.

D.M. HALL & ASSOCIATES PTY. LTD.
DETAILS NOTED

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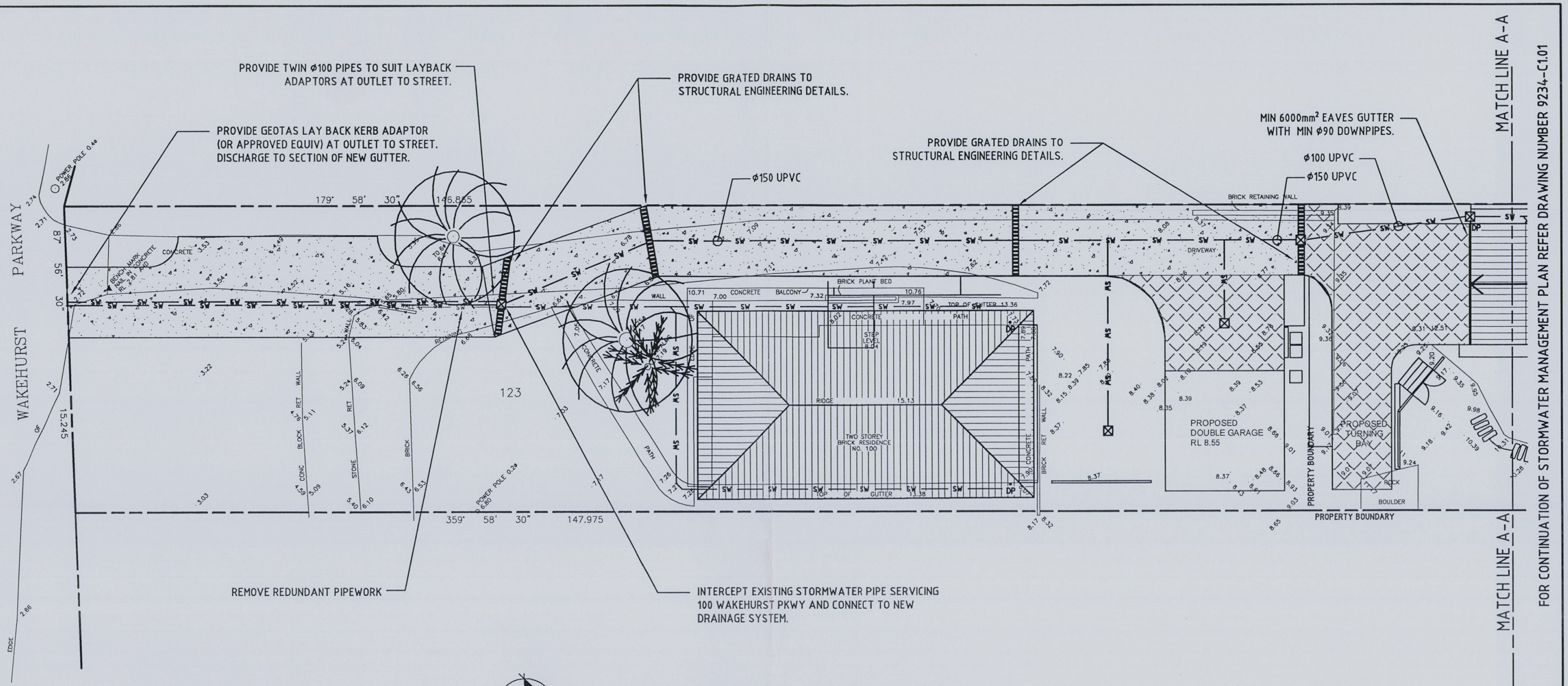
77 Anzac Ave Collaroy 2097 mob 0418861495 ph 99729812 kyle_docherty@bigpond.com

Project
NEW RESIDENCE
At 100A WAKEHURST PARKWAY, ELANORA HEIGHTS
For MR B. WHEALING

Drawing Title
ELEVATIONS

Drawn	Approved
KRD	K R DOCHERTY
Date	Purpose of Issue
5.12.12	CONSTRUCTION CERT.

Scale	Sheet	Project	Drawing	Rev
SHOWN	A1	110104	S02	0



STORMWATER MANAGEMENT PLAN - SHEET 1 of 2
SCALE 1:200

NOTES

1. ALL DIMENSIONS TO BE CONFIRMED ON SITE. LEVELS AND SITE LAYOUT BASED ON SURVEY UNDERTAKEN BY DP SURVEYING SERVICES (DATED 14 AUGUST 2006).
2. LOCATION OF ALL SERVICES MUST BE CONFIRMED ON SITE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS.
3. ALL STORMWATER DRAINAGE PIPES AND ASSOCIATED DEVICES ARE TO BE INSTALLED IN ACCORDANCE WITH RELEVANT STANDARDS, THE BUILDING CODE OF AUSTRALIA, MANUFACTURER'S RECOMMENDATIONS, SYDNEY WATER AND LOCAL COUNCIL REQUIREMENTS, AS APPLICABLE.
4. ALL INVERT LEVELS PROVIDED ON THIS DRAWING ARE REDUCED TO AHD AND BASED ON INTERPOLATED SURFACE LEVELS AND SYSTEM REQUIREMENTS.
5. PROVIDE MIN 25mm ANNULAR SPACE AROUND PIPEWORK CUT THROUGH FOOTINGS OR WALLS AND FILL SPACE WITH FLEXIBLE LINER. PROVIDE TWO FLEXIBLE JOINTS IN PIPEWORK AT 300mm AND 700mm FROM FACE OF FOOTING OR WALL. PENETRATIONS BELOW SURFACE LEVEL TO BE SEALED AND MADE WATERTIGHT.
6. ALL ROOF GUTTERS TO BE FITTED WITH LEAF GUARDS COMPLIANT WITH AS3959.
7. ALL PIPES TO BE LAID WITH MIN 1% FALL IN INTENDED DIRECTION OF FLOW.

LEGEND

- SW — NEW STORMWATER PIPE (SURFACE WATER AND TANK OVERFLOWS)
- W — W — W — NEW RAINWATER PIPE (ROOFWATER TO RAINWATER TANK)
- SW — EXISTING STORMWATER PIPE (APPROX)
- ⊠ STORMWATER JUNCTION/INLET PIT
- 8.40 EXISTING SURFACE RL (mAHD)
- TIMBER DECKING
- CONCRETE
- CONCRETE/GRASS PERMEABLE PAVING

DIAL 1100 BEFORE YOU DIG

D.M. BALL & ASSOCIATES PTY LTD DETAILS NOTED

ISSUE	DESCRIPTION	BY	APR	DATE
A	ISSUED FOR CONSTRUCTION CERTIFICATE	JC	KW	06.07.10

MF Architecture
PO Box 417,
MANLY NSW 1655
m: 0434 904 582
email: mforan@mfarchitecture.com.au

CHARTERED PROFESSIONAL ENGINEER:
Waddington Consulting Pty Ltd
ACN 130 522 851
Structural and Civil Engineering Consultants
Suite 6, Level 5, 22 Central Avenue Manly NSW
P.O. Box 1044 Manly NSW 1655
Phone (02) 9976 0070 Fax (02) 9976 0095
Email enquiries@wadconsulting.com

PROJECT: PROPOSED NEW RESIDENCE
100A WAKEHURST PKWY, ELANORA HEIGHTS
for: BAUEN CONSTRUCTIONS

DRAWING TITLE: STORMWATER MANAGEMENT PLAN - SHEET 2 of 2

DESIGN: K.W.	DATE: JULY 2010		
DRAWN: K.W.	SCALE: 1:200		
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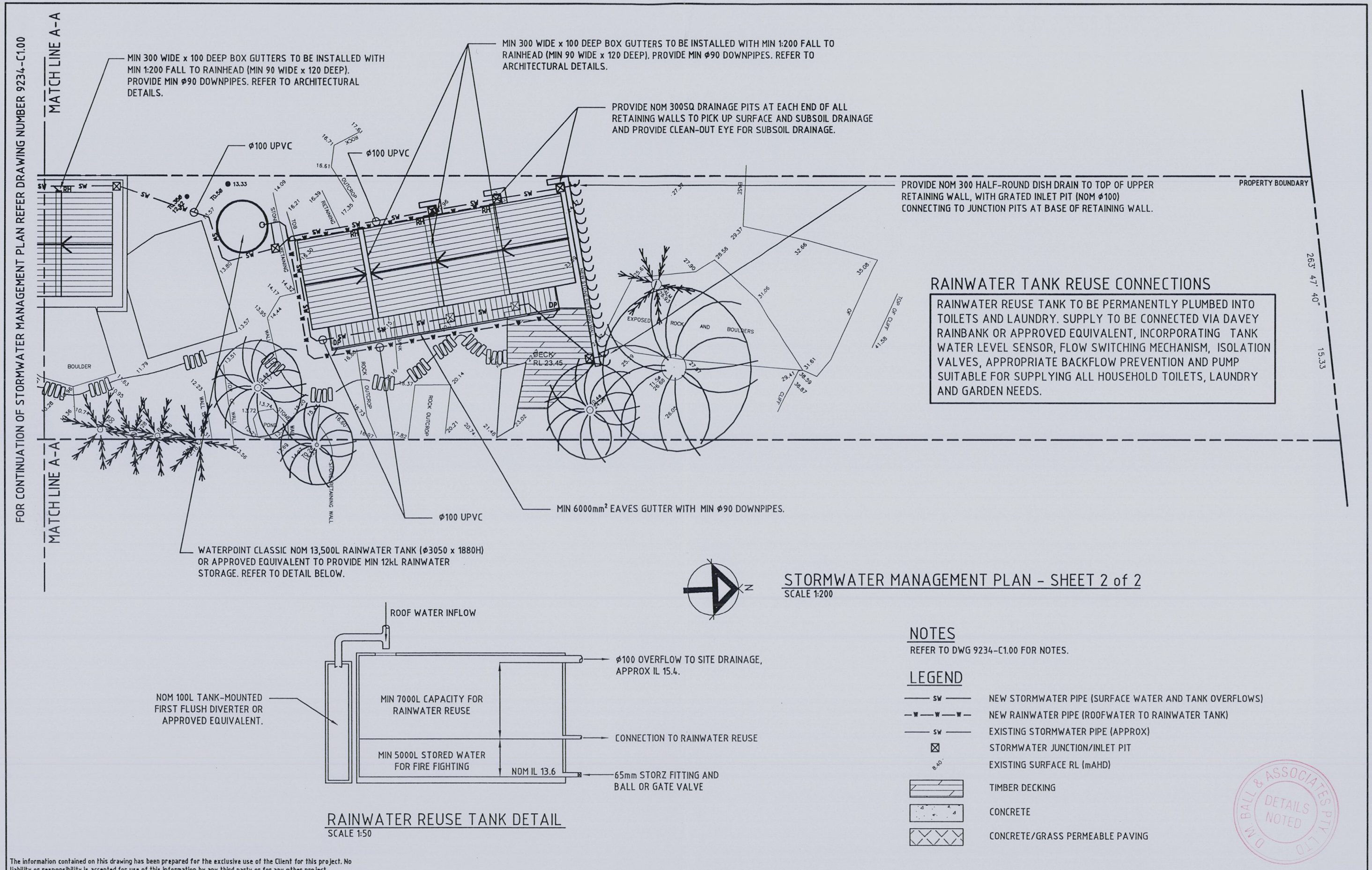
SIGNED: K Waddington		SIZE	A3
DRAWING No: 9234-C1.00		REV	A



RAINWATER REUSE TANK DETAIL
SCALE 1:50

STORMWATER MANAGEMENT PLAN - SHEET 2 of 2
SCALE 1:200

NOTES
REFER TO DWG 9234-C1.00 FOR NOTES.

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- W — NEW RAINWATER PIPE (ROOFWATER TO RAINWATER TANK)
- SW — EXISTING STORMWATER PIPE (APPROX)
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DESIGN: K.W.	DATE: JULY 2008
DRAWN: J.C.	SCALE: AS NOTED
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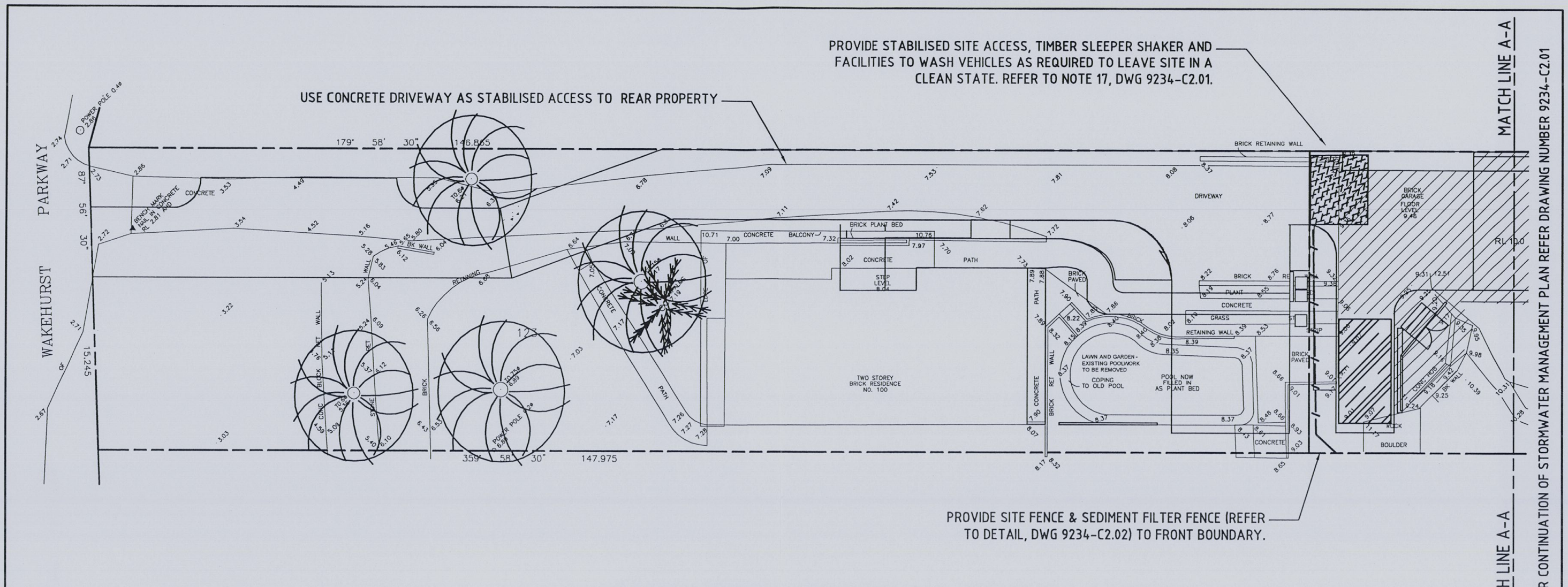
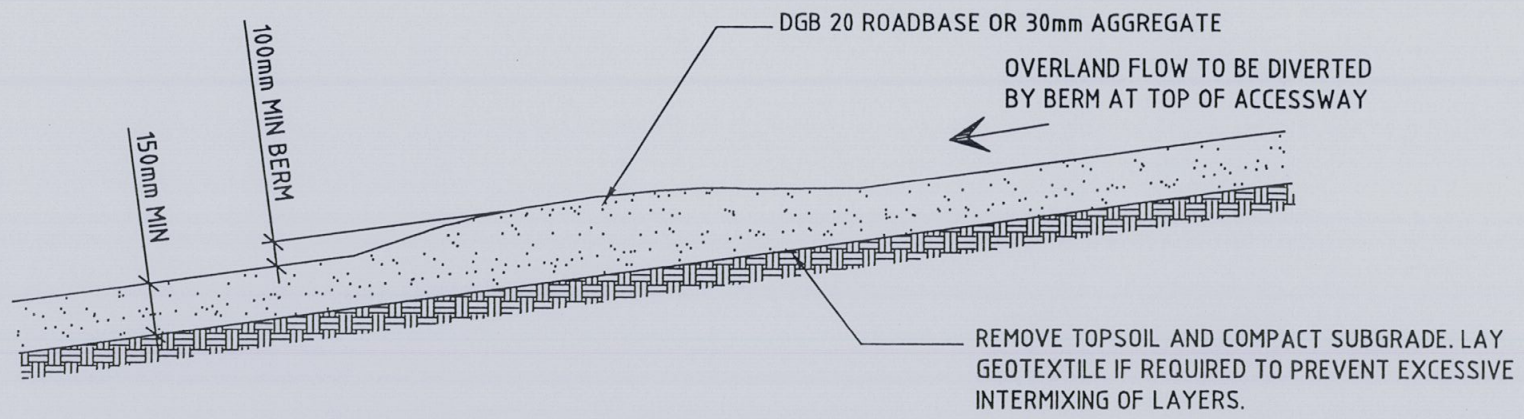


EROSION & SEDIMENT MANAGEMENT PLAN - SHEET 1 of 2

SCALE 1:200



STABILISED SITE ACCESS DETAILS

NOT TO SCALE

DIAL 1100
BEFORE YOU DIG

LEGEND

- × 69.63 — SURFACE LEVEL (mAHD)
- DENOTES AREA TO BE EXCAVATED. EXCESS EXCAVATED MATERIAL TO BE REMOVED FROM SITE.
- DIRECTION OF OVERLAND FLOW
- STOCKPILE AREAS
- SEDIMENT FILTER FENCE. REFER TO DETAIL.

NOTES

REFER TO DRAWING 9234-C2.01 FOR NOTES.

D.W. BALL & ASSOCIATES PTY LTD — DETAILS NOTED

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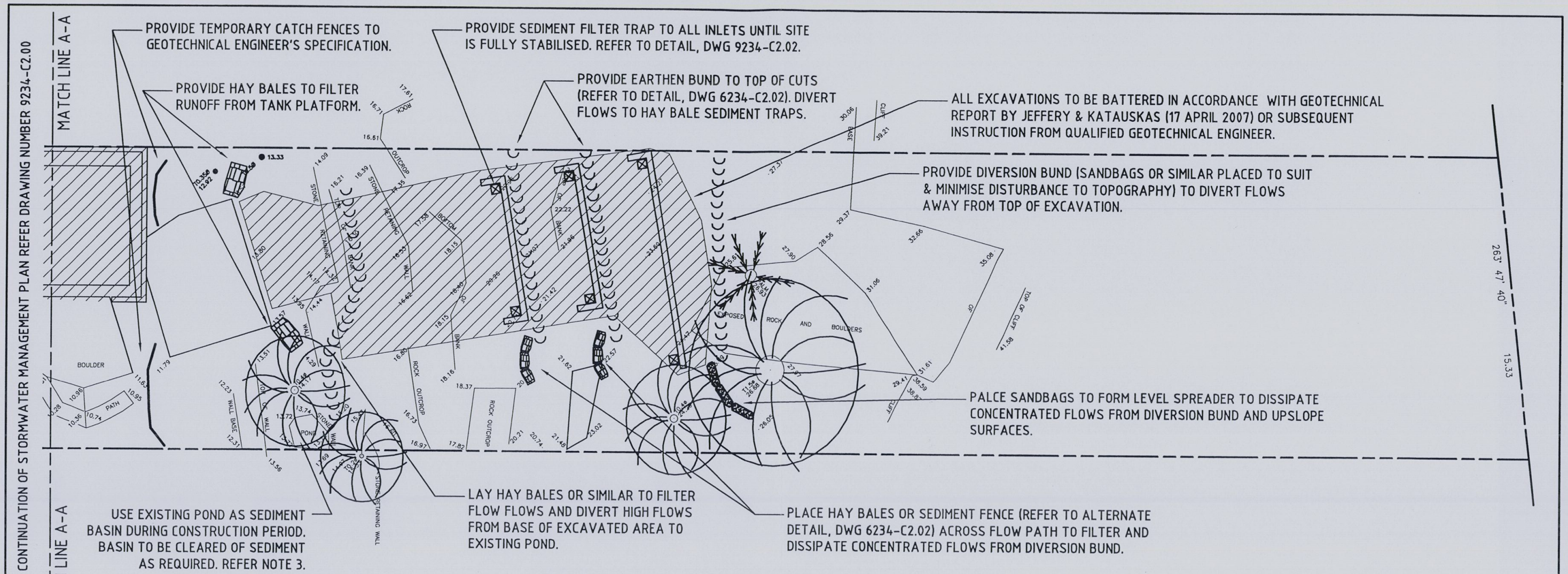

EROSION & SEDIMENT MANAGEMENT PLAN - SHEET 2 of 2

SCALE 1:200

NOTES

1. EROSION AND SEDIMENT CONTROL MEASURES, AS DESCRIBED IN THIS EROSION AND SEDIMENT CONTROL PLAN, MUST BE INSTALLED AND FUNCTIONAL PRIOR TO COMMENCEMENT OF SITE WORKS.
2. ALL EXISTING VEGETATION TO BE RETAINED AND OTHERS THAT NEED NOT BE DISTURBED SHOULD BE FENCED OFF FOR PROTECTION FROM CONSTRUCTION ACTIVITIES.
3. EROSION AND SEDIMENT CONTROL STRUCTURES ARE TO BE CLEARED OF ACCUMULATED SEDIMENT AND DETRITUS ON A REGULAR BASIS (MINIMUM ONCE A WEEK) AND AFTER ALL SIGNIFICANT RAINFALL EVENTS.
4. PROVIDE APPROPRIATE BINS FOR CONCRETE AND MORTAR SLURRIES, PAINTS, LIGHTWEIGHT WASTE AND LITTER. LIGHT-WEIGHT WASTE IS TO BE WIND-PROOFED. WASTE IS TO BE DISPOSED OF IN A TIMELY AND APPROVED MANNER.
5. WHERE A SMOOTH SURFACE IS NOT REQUIRED, DISTURBED AREAS SHOULD BE LEFT IN A ROUGHENED SURFACE CONDITION TO REDUCE RUNOFF VELOCITY AND INCREASE INFILTRATION.
6. TOPSOIL FROM EXCAVATION AREAS SHALL BE STRIPPED AND STOCKPILED FOR USE IN REHABILITATION OF DISTURBED AREAS AND/OR FUTURE LANDSCAPING.
7. LOOSE BUILDING MATERIALS (SAND ETC) TO BE STOCKPILED ON SITE AT DESIGNATED AREA. STOCKPILES TO BE COVERED OR OTHERWISE STABILISED TO REDUCE WIND AND WATER IMPACTS.
8. STOCKPILES OF LOOSE MATERIALS TO BE BATTERED AT 2V:1H AND NO MORE THAN 2 METRES IN HEIGHT UNLESS PROHIBITED BY INSUFFICIENT AREA.
9. REMOVE SPILT SAND AND OTHER MATERIALS FROM FLOW PATHS, GUTTERS, DRIVEWAYS AND PAVED AREAS AT THE END OF EACH DAY'S WORK.
10. DO NOT OPEN ANY TRENCH UNLESS IT IS LIKELY TO BE CLOSED WITHIN THREE DAYS. WHEN TRENCHING, PLACE EXCAVATED SOIL UPSLOPE OF THE TRENCH AND AWAY FROM AREAS OF CONCENTRATED RUNOFF.
11. WHEN CONSTRUCTING SEDIMENT FILTER FENCE, JOIN SECTIONS OF GEOTEXTILE AT SUPPORTS WITH A 150mm OVERLAP.
12. ALL DISTURBED AREAS ARE TO BE REHABILITATED AS SOON AS POSSIBLE. SITE MUST BE STABILISED PRIOR TO REMOVAL OF EROSION AND SEDIMENT CONTROL MEASURES.
13. CONSTRUCT SMALL EARTHERN BUND UPSLOPE OF ALL EXCAVATIONS AND STOCKPILES OF LOOSE MATERIALS TO DIVERT SURFACE RUNOFF AWAY FROM BATTER SLOPES AND STOCKPILES.
14. ROOF GUTTERING IS TO BE CONNECTED TO THE DRAINAGE SYSTEM AS SOON AS POSSIBLE.
15. UNDERTAKE PRIMARY REVEGETATION BY TURFING OR COVERING SURFACE WITH MULCH TO REDUCE EROSION HAZARD. MULCH THICKNESS TO BE 20-40mm FOR AREAS TO BE SEEDED OR 75-100mm IN AREAS REQUIRING LONG-TERM MULCHING.
16. BUILDING PLATFORM MAY ALSO BE USED AS STOCKPILE AREA.
17. WHEELS & UNDER-CARRIAGE OF EXCAVATOR TO BE WASHED TO REMOVE LOOSE MATERIALS & CLAY PRIOR TO LEAVING SITE. IF REQUIRED, OTHER VEHICLES LEAVING SITE TO BE WASHED TO MAINTAIN PUBLIC ROADS IN A CLEAN CONDITION.
18. UNDERTAKE ANY ADDITIONAL EROSION AND/OR SEDIMENT CONTROL MEASURES NECESSARY TO COMPLY WITH THE PROTECTION OF THE ENVIRONMENT OPERATIONS ACT (1997).

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LEGEND

- × 69.63 — SURFACE LEVEL (mAHD)
- DENOTES AREA TO BE EXCAVATED. EXCESS EXCAVATED MATERIAL TO BE REMOVED FROM SITE.
- DENOTES AREA TO BE FILLED
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- STOCKPILE AREAS
- SEDIMENT FILTER FENCE. REFER TO DETAIL.

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DRAWING TITLE:
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DESIGN: S.W.	DATE: JULY 2008		
DRAWN: J.C.	SCALE: 1:200		
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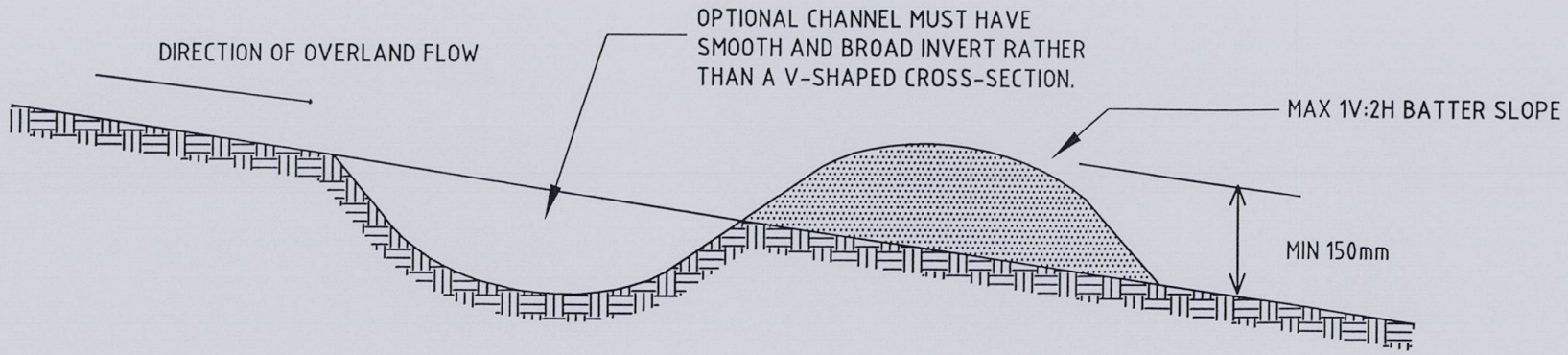
SIGNED: K Waddington		SIZE	A3
DRAWING No: 9234-C2.01		REV	A



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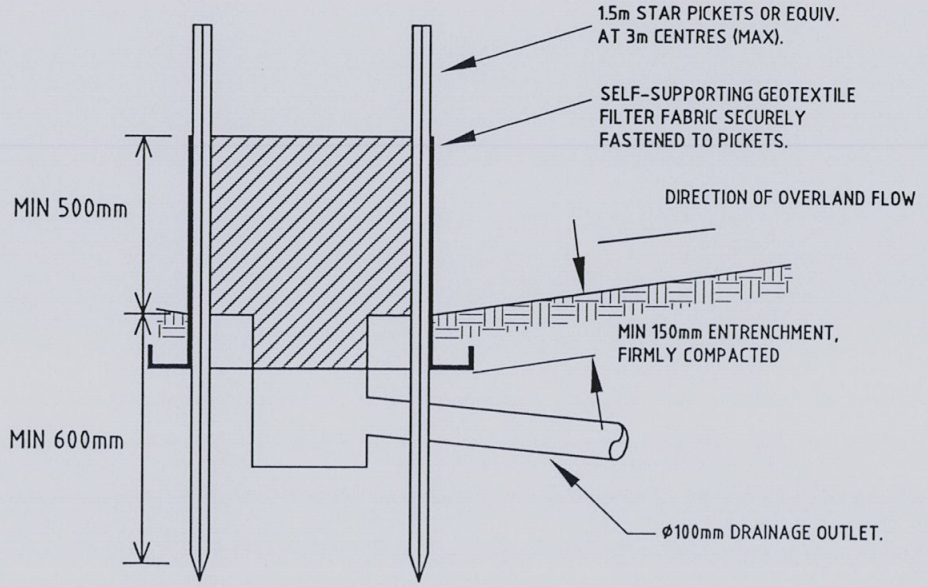
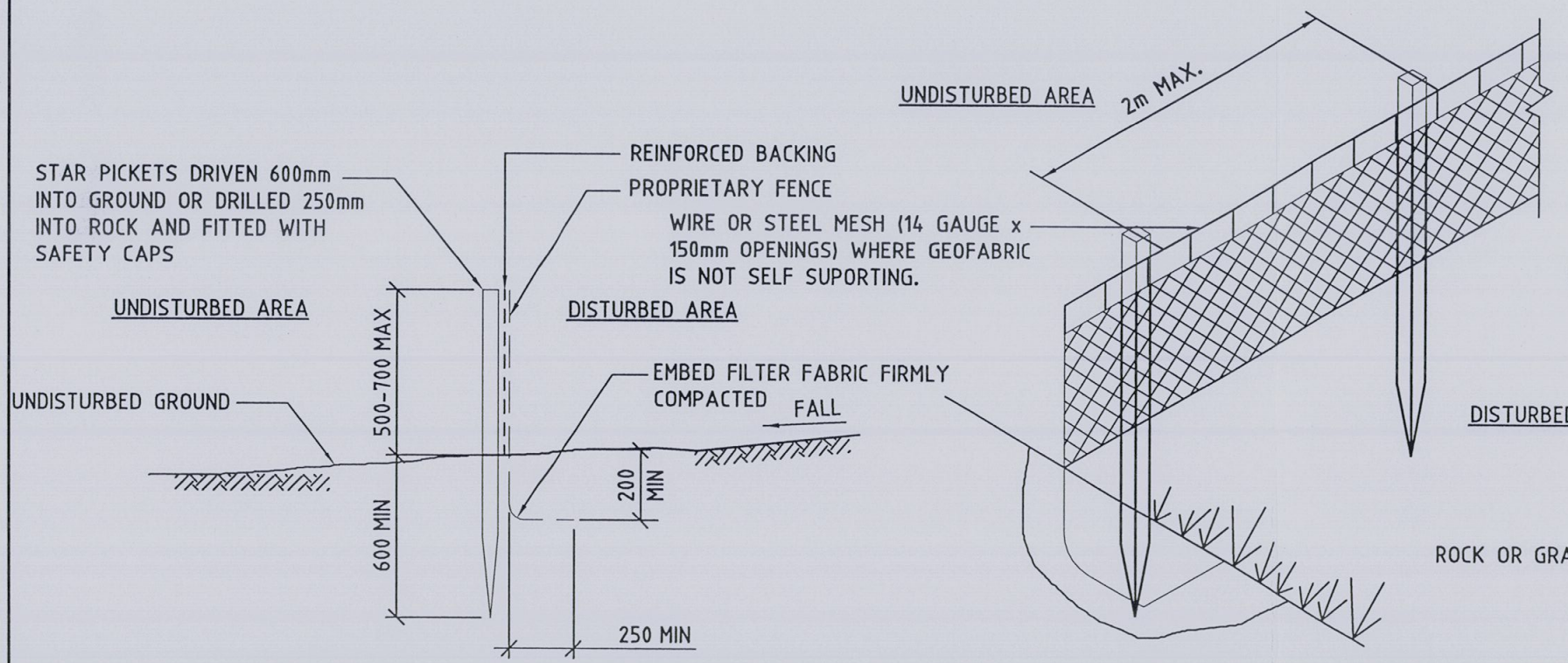


SEDIMENT FILTER FENCE TRAP
NOT TO SCALE



TYPICAL SECTION

TYPICAL ELEVATION

PROPRIETARY SILT FENCE DETAILS
NOT TO SCALE

SEDIMENT FILTER FENCE

ALTERNATIVE DETAIL
NOT TO SCALE

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