SUBURBAN LAND AGENCY
FIRST GRANT CONTRACT –
LAND READY SCHEDULE

DATE OF THIS CONTRACT				
LAND		Block	Section	Division/District
		See Block	**Summary Table**	**Strathnairn**
STAGE		**See Block Summary Table**		
OCCUPANCY		Vacant Possession		
CO-OWNERSHIP	Mark one *See clause 16*	☐ Tenants in common (*Show shares*)		☐ Joint Tenants
SELLER	Full name ACN/ABN Address	**Suburban Land Agency** 27 105 505 367 480 Northbourne Avenue, Dickson ACT 2602		
SELLER'S SOLICITOR	Firm	Clayton Utz		
	Ref	Alfonso del Rio / Megan Telford		
	Phone	(02) 6279 4049		
	Fax	(02) 6279 4099		
	Address	GPO Box 9806 Canberra ACT 2601		
	Email	conveyancing@claytonutz.com		
BUYER	Full Name ACN/ABN Address			
	Email			
BUYER'S SOLICITOR	Firm			
	Ref			
	Phone			
	Fax			
	DX/Address			
	Email			
RESIDENTIAL WITHOLDING TAX		New residential premises? ☐ Yes ☒ No Subdivision of potential residential land? ☒ Yes ☐ No Buyer required to make a withholding payment? ☒ Yes ☐ No (insert details on p.2)		
FOREIGN RESIDENTIAL WITHOLDING TAX		Price/value of Land over $750,000 ☐ Yes ☐ No Clearance Certificate attached? ☒ Yes ☐ No		
PRICE	Price Less Deposit Balance	**See Block Summary Table** (The Price is GST inclusive) (5% of Price)		
COMPLIANCE BOND	*See clause 5*	**See Block Summary Table**		
EARLIEST DATE OF EXPIRY OF DEPOSIT BOND OR BANK GUARANTEE	*See clause 3*	60 days after the Date for Completion		
DATE FOR COMPLETION	*See clause 4*	30 Working Days after the date of this Contract		
STANDARD ANNEXURES	Documents annexed to this Contract	Annexure A - Deposited Plan; Annexure B - Specimen Lease; Annexure C - Special Conditions, Annexure D- Housing Development Requirements, Annexure E- Director's Guarantee		
SPECIAL CONDITIONS	Indicate whether any special conditions apply	☒ Yes	☐ No	

READ THIS BEFORE SIGNING

Before signing this contract you should ensure that you understand your rights and obligations. You should get advice from your solicitor.

Authorised Delegate of the Suburban Land Agency signature:		Buyer signature:	
Delegate name:		Buyer name:	
Witness signature:		Buyer signature:	
Witness name:		Buyer name:	
		Witness signature:	
		Witness name:	

RW Amount

(Residential Withholding Payment) — Further Details

The supplier will frequently be the Seller. However, sometimes further information will be required as to which entity is liable for GST (eg if the Buyer is part of a GST group, where the GST representative has the GST liability). If more than one supplier, provide details for each supplier.

Supplier	Name	Suburban Land Agency		
	ABN	27105505367	Phone	(02) 6205 0600
	Business address	TransACT House, 470 Northbourne Avenue, Dickson ACT 2602		
	Email			
Residential Withholding Tax	Supplier's portion of the RW Amount:			100%
	RW Percentage:			7**%**
	RW Amount (ie the amount that the Buyer is required to pay to the ATO):			##
	Is any of the consideration not expressed as an amount in money?			☐ Yes ☒ No
	If 'Yes', the GST inclusive market value of the non-monetary consideration:			**$**
	Other details (including those required by regulation or the ATO forms):			

SUBURBAN LAND AGENCY

Stage	Section	Block	OldSect/Blk	Price	Deposit	Bond To Be Paid	Comments
1A	15	1	AH / c			$5,000.00	Terrace Pack
1A	15	2	AH / b			$5,000.00	Terrace Pack
1A	15	3	AH / a			$5,000.00	Terrace Pack
			Total				

Australian Government
Australian Taxation Office

SUBURBAN LAND AGENCY
C/o AKIYO FUJITA-PHILPOT
ACT GOVERNMENT SOLICITOR
LEVEL 6 12 MOORE STREET
CANBERRA CITY ACT 2601

Our reference: 2410205113219
Phone: 13 28 66

16 May 2019

Your foreign resident capital gains withholding clearance certificate

› Purchasers are not required to withhold and pay an amount
› Provide a copy to the purchaser and retain a copy for your records

Hello

We have decided that purchasers are not required to withhold and pay an amount. Your certificate is below.

Reference number	2410205113219
Vendor name	SUBURBAN LAND AGENCY
Vendor address	ACT GOVERNMENT SOLICITOR LEVEL 6 12 MOORE STREET CANBERRA CITY ACT 2601
Clearance certificate period	2 May 2019 to 5 May 2024

The Commissioner may withdraw this clearance certificate at any time if we obtain further information indicating you are a foreign resident.

Yours sincerely

Tim Dyce
Deputy Commissioner of Taxation

NEED HELP?

You can find out more about foreign resident capital gains withholding on our website at **ato.gov.au/FRCGW**

CONTACT US

If you have any questions, contact us between 8:00am and 5:00pm Australian Eastern Standard Time, Monday to Friday on:

- **13 28 66** if located in Australia, or
- **+61 2 6216 1111** if located outside Australia and ask for **13 28 66**.

1 GRANT OF THE LEASE

1.1 The Seller will procure the grant of the Lease to the Buyer on Completion.

1.2 The Lease will be granted substantially upon the terms and conditions of the Specimen Lease.

2 TERMS OF PAYMENT

2.1 On Completion the Buyer must pay to the Seller in Canberra the Balance of the Price by unendorsed bank cheque.

2.2 On the Date of this Contract, the Buyer must pay the Deposit to the Seller.

2.3 The Deposit is released to the Seller (when paid) and become the Seller's property absolutely (being part payment of the Price).

2.4 If the Deposit is:

(a) not paid on time and in accordance with clause 2.2; or

(b) paid by cheque and the cheque is not honoured on first presentation, the Buyer is in default and the Seller may terminate this Contract immediately by written notice to the Buyer (without the notice otherwise necessary under clause 25) and clause 26 applies.

2.5 If the Seller does not terminate this Contract in accordance with clause 2.4, then this Contract remains on foot, subject to this clause 2.5, until the Seller terminates the Contract pursuant to clause 2.4 or waives the benefit of clause 2.4 pursuant to clause 2.7.

2.6 This clause 2 is for the benefit of the Seller and the obligations imposed on the Buyer by this clause 2 are essential. The obligations imposed on the Buyer by this clause 2 bind the Buyer notwithstanding any indulgence, waiver or extension of time by the Seller to the Buyer.

2.7 The Seller may at any time before this Contract is terminated notify the Buyer in writing that the benefit of this clause 2 is waived.

2.8 If the Contract is:

(a) rescinded; or

(b) terminated due to the default of the Seller, and the Buyer is entitled to a refund of the Deposit,

then the Seller will account to the Buyer for the Deposit paid.

2.9 The Seller is not liable to pay interest on any refunded Deposit provided that the Deposit is refunded to the Buyer within 15 Working Days of the date the Contract is terminated due to the Seller's default or rescinded.

2.10 The payment of the Deposit by the Buyer to the Seller does not create a charge over the Land to the value of the Deposit or any other amount.

3 DEPOSIT BOND AND BANK GUARANTEE

3.1 The Deposit to be paid pursuant to clause 2.2 may be accepted by way of a Deposit Bond or Bank Guarantee provided that at least 3 Working Days prior to the Date of this Contract the Buyer:

(a) informs the Seller of their intention to provide a Deposit Bond or Bank Guarantee; and

(b) provides the Seller with a copy of the proposed Deposit Bond or Bank Guarantee for approval.

3.2 The expiry date for the Deposit Bond or Bank Guarantee must not be earlier than the Earliest Date of Expiry of Deposit Bond or Bank Guarantee specified in the Schedule.

3.3 The Deposit Bond or Bank Guarantee must:

(a) show the Seller as the beneficiary of the Deposit Bond or Bank Guarantee; and

(b) be for an amount that is not less than 10% of the Price.

3.4 The Buyer must pay the amount stipulated in the Deposit Bond or Bank Guarantee to the Seller by unendorsed bank cheque on Completion.

3.5 The Buyer is in default if:

(a) the Deposit Bond or Bank Guarantee has an expiry date prior to the Earliest Date of Expiry of Deposit Bond or Bank Guarantee and is not renewed to the satisfaction of the Seller at least 10 Working Days prior to the expiry of the Deposit Bond or Bank Guarantee; or

(b) the provider of the Deposit Bond or Bank Guarantee is placed under external administration of any nature before Completion and the Buyer has not provided a replacement Deposit Bond or Bank Guarantee to the same value and on the same terms and conditions from a solvent party within 5 Working Days of the provider being placed in such administration.

3.6 If the Buyer is in default under clause 3.5 it will be deemed to be a failure by the Buyer to pay the Deposit under clause 2 and immediately, and without the notice necessary under clause 25, clause 26 applies.

4 DATE FOR COMPLETION

4.1 Completion must take place in Canberra on the Date for Completion or as otherwise determined by the Contract and if not specified or determined, within a reasonable time.

4.2 The Seller will not be liable to the Buyer for any damage or loss caused to the Land after Completion, including building waste, except where caused by the negligent or deliberate action or omission of the Seller, its employees, agents or contractors.

5 COMPLIANCE BOND

5.1 The Buyer must provide to the Development Manager at Completion the Compliance Bond as security for the performance of the Buyer's obligations in respect of clauses 7, 10 and 40 of this Contract following Completion.

5.2 The Development Manager will not be required to hold the Compliance Bond in a trust account or act as a fiduciary in relation to the Compliance Bond.

5.3 The Buyer must notify the Development Manager when it considers it has reached Dwelling Completion and the Development Manager must inspect the Land within 10 Working Days of such notice.

5.4 If the Development Manager does not believe that Dwelling Completion has been achieved, it must notify the Buyer in writing of this identifying its reasons. The Development Manager will be entitled to charge an additional inspection fee of $550 (GST inclusive) for each time that the Development Manager, following notification by the Buyer under clause 5.3, notifies the Buyer that Dwelling Completion has not been achieved.

5.5 If the Development Manager believes Dwelling Completion has been achieved within 2 years of Completion then it must notify the Buyer within 2 Working Days of its inspection and must pay to the Buyer, or if agreed to by the Development Manager a person nominated by the Buyer, the Compliance Bond (less any amounts deducted in accordance with this Contract) within 20 Working Days of that inspection.

6 SIGNING OF LEASE

6.1 The Buyer must, no later than 20 Working Days from the date the Seller serves the Lease on the Buyer:

(a) sign each copy of the Lease; and;

(b) return to the Seller's Solicitor each copy of the signed Lease.

6.2 The Buyer undertakes to register the Lease following Completion.

7 HOUSING DEVELOPMENT REQUIREMENTS AND SELLER APPROVAL

7.1 The Buyer must comply with the Housing Development Requirements in respect of any dwelling to be constructed on the Land.

7.2 If there is any variation to the Housing Development Requirements prior to Completion, the Seller may notify the Buyer and provide:

(a) a copy of, or website link to, the final form of the amended document; or

(b) the variations,

to the Buyer prior to Completion.

7.3 In the event that a change is made to the Housing Development Requirements which causes the Buyer a verifiable loss in excess of 5% of the Price, the Buyer may within 10 Working Days of being notified of the amended Housing Development Requirements rescind this Contract and clause 28 will apply.

7.4 No building or improvements are to be erected or altered on the Land without the written endorsement of the Development Manager. This obligation ceases to apply to the Land on Dwelling Completion.

7.5 The Development Manager must not unreasonably withhold its endorsement to the erection or alteration of any building or improvements where they are in accordance with the Housing Development Requirements and the approval and consent of all relevant authorities.

7.6 The Buyer must obtain from the relevant authorities all approvals necessary to erect any buildings or improvements on the Land and in accordance with the Housing Development Requirements.

7.7 The Buyer acknowledges that the Land is ready and available for inspection.

7.8 The Buyer enters into this Contract in reliance upon the Deposited Plan annexed to this Contract and on the Buyer's own enquiries.

7.9 If there is an inconsistency between the Housing Development Guide and the Deposited Plan, the Deposited Plan prevails.

7.10 The Buyer cannot make a claim or objection or rescind or terminate or make a claim for compensation under clause 24 of this Contract in respect of any matter set out in the Housing Development Guide.

8 VARIATION TO LAND AND HOUSING DEVELOPMENT REQUIREMENTS

8.1 The Buyer acknowledges that the Specimen Lease, the Housing Development Requirements, the Plans and any other documentation made available in relation to the Land may be affected by:

(a) the requirements of legislation;

(b) variations to the Territory Plan;

(c) the requirements of government authorities; and/or

(d) physical conditions affecting the Works

and may result in one or more of the following:

(e) minor redefinition of the boundaries of the Land;

(f) minor road re-alignment or dedication; and

(g) minor variations of the easements relating to the provision of Utility Services.

8.2 Any redefinition, road realignment or dedication or variation of easements will be deemed to be minor if it does not materially and detrimentally affect the use of the Land.

8.3 The area of the Land specified in the Block Details Plan is subject to final survey and in the event of inconsistency with the area in the Deposited Plan, the Deposited Plan prevails.

8.4 The Buyer cannot make a claim or objection or rescind or terminate or make a claim for compensation under clause 24 of this Contract in respect of any matter set out in clause 8.1 or clause 8.3.

9 PLANNING CONDITIONS

9.1 The Buyer acknowledges that the Planning and Land Authority is responsible for all statutory development consents and approvals sought by or on behalf of the Buyer in relation to the Land and the Buyer therefore releases the Seller and Development Manager from any liability, cause of action or any other claim in relation to disturbance, loss or detriment caused by the Planning and Land Authority granting, with or without conditions, or denying any consent or approval in relation to the Land.

9.2 The Buyer acknowledges the obligation to make the Buyer's own enquiries and to satisfy itself as to the currency and accuracy of information contained in the Territory Plan.

9.3 The Buyer acknowledges that the Planning and Land Authority is responsible for the Territory Plan and the Buyer will make no claim against the Seller whatsoever in this regard.

9.4 The Buyer acknowledges that nothing in this Contract (including the Housing Design Requirements) or the fact of Completion implies or means that any required approvals, consents or licences regarding planning, design, siting and any other matters relating to the

Buyer's development of the Land will be granted by the regulatory authorities or other agencies of the Australian Capital Territory with or without conditions.

10 DRIVEWAY CROSSOVERS AND VERGES

10.1 The Buyer will be responsible for the construction of the driveway crossover:

(a) if there is no footpath on the Land, from the kerb to the property boundary; and

(b) if there is a footpath on the Land, from the kerb to the property boundary but excluding the footpath which must not be altered in any way.

10.2 The Buyer must pay regard to and not damage or affect any footpath located on the Land.

10.3 All driveway crossovers are to be approved by the relevant authority.

10.4 The Buyer must not cause or allow any damage or destruction to the public domain adjoining the land, being all verges, landscaping (including street trees), gutters, kerbs, footpaths and driveway crossovers.

10.5 The buyer must lay turf, complying with the Housing Development Requirements, in the verge areas between the front boundary of the Land and the kerb. Other forms of soft landscaping treatments to the verge areas may only be used with the prior written consent (which may be given in its absolute discretion) of the Seller.

11 FRONT LANDSCAPING

11.1 Subject to the Buyer complying with this Contract and achieving Dwelling Completion within 2 years of Completion, the Seller will provide the Front Landscaping to the Land.

11.2 On or before Dwelling Completion, the Buyer must select a Front Landscaping garden design in accordance with the Housing Development Requirements and complete, sign and provide to the Seller the Front Landscaping Application Form.

11.3 Within approximately 3 months of Dwelling Completion, having regard to the Front Landscaping garden design selected and weather conditions, the Seller will commence the Front Landscaping.

11.4 The Buyer agrees to provide, or to procure its successor to provide, the Seller or the Development Manager or their nominated contractor with access to the Land at all times reasonably required by the Seller or the Development Manager or their nominated contractor for the sole purpose of providing the Front Landscaping.

11.5 The Buyer releases the Seller and the Development Manager from any liability, cause of action or any other claim in relation to the Front Landscaping except to the extent caused by the negligent or deliberate action or omission of the Seller or the Development Manager or their agents. For clarity, this release does not extend to the Seller's nominated contractor.

12 PROPERTY ACT

12.1 The Property Act does not apply to this Contract as this Contract is not a sale of residential property and the grant of the Lease will be the first grant of a crown lease over the Land.

13 NON COMPLYING TRANSFERS NOT TO BE USED

13.1 The Buyer acknowledges that it will not be able to use the non complying transfer provisions of section 17 of the *Duties Act 1999* (ACT) in relation to this Contract as this Contract will be the first grant of the Lease.

14 ENTIRE AGREEMENT

14.1 The Buyer agrees that this Contract sets out the entire agreement of the parties on the subject matter of this Contract and supersedes any prior agreement, advice, material supplied to the Buyer or understanding on anything connected with the subject matter of this Contract.

15 NO RELIANCE

15.1 Each party has entered into this Contract without reliance upon any representation, statement or warranty (including sales and marketing material and preliminary artwork) except as set out in this Contract.

15.2 The Buyer:

(a) relies on its own enquiries in relation to the Land; and

(b) warrants that in entering into this Contract the Buyer:

(i) has not relied on any express or implied statement, warranty or representation whether oral, written or otherwise made by or on behalf of the Seller to the Buyer in connection with the Land;

(ii) has not relied on any documentation made available by or on behalf of the Seller to the Buyer in relation to the Land other than documentation forming part of this Contract; and

(iii) is satisfied as to the nature, quality and condition of the Land and the purposes for which the Land may be used.

15.3 The Seller makes no warranty as to the accuracy or completeness of any document made available by or on behalf of the Seller to the Buyer in connection with the Land other than documentation forming part of this Contract.

16 CO OWNERSHIP

16.1 Where the Buyer consists of more than one person, as between themselves, they agree to buy the Land in the specified manner of Co-ownership or if one alternative is not marked, as joint tenants.

17 NON MERGER

17.1 If any term of this Contract may be given effect to after Completion that term will not merge but will continue in force for as long as necessary to give effect to it.

18 BUYER RIGHTS AND LIMITATIONS

18.1 The Buyer is not entitled to make any requisitions on the title to the Land.

18.2 The Buyer cannot make a claim or objection or rescind or terminate or make a claim for compensation under clause 24 of this Contract in respect of:

(a) Utility Services for the Land being a joint service or passing through another property, or any Utility Services for another property passing through the Land;

(b) a promise, representation or statement about this Contract, the Land or the Lease, not made in this Contract;

(c) the existence of regrading, fill or other disability of or upon the Land, whether caused by the Commonwealth of Australia, the Seller, previous occupants of the Land or otherwise; and

(d) anything disclosed in this Contract (except an Affecting Interest).

18.3 The Buyer acknowledges, understands and accepts that the existence of regrading, fill, contamination of any Substance or other disability of or upon the Land may result in work for the construction of any building on the land being more extensive and expensive than it may otherwise have been in the absence of such regrading, fill, contamination of any substance or other disability.

18.4 The Seller makes no warranty or representation as to the environmental condition or state of the soil, ground water, contamination or the existence or non-existence of any Substance on or affecting the Land.

19 SELLER WARRANTIES

19.1 The Seller warrants that at the Date of this Contract:

(a) the Seller will be able to complete at Completion;

(b) the Seller has no knowledge of any unsatisfied judgment, order or writ affecting the Land;

(c) the Seller has no knowledge of any current or threatened claims, notices or proceedings that may lead to a judgment, order or writ affecting the Land; and

(d) the Seller is not aware of any material change in the matters disclosed in the Housing Development Requirements.

19.2 The Seller warrants that on Completion:

(a) the Seller will have the capacity to complete;

(b) there will be no unsatisfied judgment, order or writ affecting the Land;

(c) the Seller has no knowledge of any current or threatened claims, notices or proceedings that may lead to a judgment order or writ affecting the Land; and

(d) the Seller is not aware of any encroachments by or upon the Land except as disclosed. This warranty does not extend to the location of any dividing fence.

19.3 The Seller gives no warranties as to the present state of repair of any of the Improvements or condition of the Land, except as required by law.

20 ADJUSTMENTS

20.1 The Lease will be granted on Completion. As a result, there will be no adjustments of Income or Land Charges.

21 TERMS OF POSSESSION

21.1 The Seller must give the Buyer vacant possession of the Land on Completion unless otherwise marked in the Schedule.

22 INSPECTION AND CONDITION OF LAND

22.1 The Buyer may on reasonable notice to the Seller inspect the Land but only during the period 10 Working Days prior to the Date for Completion.

22.2 Subject to clause 4.2, the Seller must leave the Land clean and tidy on Completion.

23 ERRORS AND MISDESCRIPTIONS

23.1 The Buyer will be entitled to compensation on Completion (and the Price will be reduced accordingly) in full and final settlement if the Buyer suffers a loss as a result of an error of any kind or misdescription if the Buyer makes a claim for compensation before Completion.

23.2 This clause 23 applies even if the Buyer did not take notice of or rely on anything in this Contract containing or giving rise to the error or misdescription.

23.3 The Buyer is not entitled to compensation to the extent the Buyer knew the true position before the Date of this Contract.

24 COMPENSATION CLAIMS BY BUYER

24.1 This clause 24 applies to claims for compensation arising out of this Contract made by the Buyer against the Seller including claims under clause 23.

24.2 To make a claim for compensation (including a claim under clause 23) the Buyer must give notice to the Seller before Completion specifying the amount claimed and:

(a) the Seller can rescind if in the case of a claim that is not a claim for delay:

(i) the total amount claimed exceeds 5% of the Price;

(ii) the Seller gives notice to the Buyer of an intention to rescind; and

(iii) the Buyer does not give notice to the Seller waiving the claim within 10 Working Days after receiving the notice; and

(b) if the Seller does not rescind under clause 24.2(a), the parties must complete and:

(i) the claim must be finalised (subject to clause 24.2(b)(v)) either by agreement or, failing agreement, by an arbitrator appointed by the parties or, if an appointment is not made within 20 Working Days of Completion, by an arbitrator appointed by the President of the Law Society of the Australian Capital Territory at the request of a party;

(ii) the decision of the arbitrator is final and binding except for;

a. manifest error by the arbitrator obvious on its face in the determination by the arbitrator;

b. error in the application of law by the arbitrator in making his or her determination; or

c. improper or unlawful conduct by the arbitrator or either Party that affected or might reasonably be thought to have affected the arbitrator's determination;

(iii) the costs of the arbitration must be shared equally by the parties unless otherwise determined by the arbitrator;

(iv) the Buyer is not entitled, in respect of the claim, to more than the total amount claimed and the costs of the Buyer; and

(v) the claim lapses if the parties do not appoint an arbitrator and neither party asks the President of the Law Society of the Australian Capital Territory to appoint an arbitrator within 3 calendar months after Completion.

25 NOTICE TO COMPLETE AND DEFAULT NOTICE

25.1 If Completion does not take place by the Date for Completion, either party may, at any time after the Date for Completion, serve on the other party a Notice to Complete.

25.2 A Notice to Complete must appoint a time during business hours and a date being not less than 10 Working Days after service of the Notice to Complete (excluding the date of service) by which, and a place in Canberra at which, to complete this Contract.

25.3 At the time the Notice to Complete is served the party serving the Notice to Complete must:

(a) not be in default; and

(b) be ready, willing and able to complete but for some default or omission of the other party.

25.4 Completion at the time, date and place specified in the Notice to Complete is an essential term.

25.5 Where one party is in default (other than failing to complete) the other party may at any time after the default serve the party in default a Default Notice.

25.6 A Default Notice must:

(a) specify the default; and

(b) require the party served with the Default Notice to rectify the default within 5 Working Days after service of the Default Notice (excluding the date of service).

25.7 At the time the Default Notice is served, the party serving the Default Notice must not be in default.

25.8 The time specified in a Default Notice to rectify the specified default is an essential term.

25.9 Clauses 26 or 27 will apply as applicable where the party served does not comply with the Notice to Complete or the Default Notice which complies with this clause 25.

25.10 If the party serving a notice under this clause varies the time referred to in the notice at the request of the other party, the time agreed to in the variation remains an essential term. The consent to the variation must be in writing and be served on the other party.

25.11 The parties agree that the time referred to in clauses 25.2 and 25.6(b) is fair and reasonable.

26 TERMINATION – BUYER DEFAULT

26.1 If the Buyer does not comply with a Notice to Complete or a Default Notice or is otherwise in breach of an essential term then the Seller may by notice served on the Buyer terminate this Contract and may then keep, or recover and keep, the Deposit (except so much of it as exceeds 10% of the Price) and either:

(a) sue the Buyer for breach; or

(b) resell the Land and any deficiency arising on the resale and all expenses of and incidental to the resale or attempted resale and the Buyer's default are recoverable by the Seller from the Buyer as liquidated damages provided the Seller has entered into a contract for the resale of the Land within 12 months of termination.

26.2 In addition to any money kept or recovered under clause 26.1, the Seller may retain on termination any other money paid by the Buyer as security for any damages awarded to the Seller arising from the Buyer's default provided that proceedings for the recovery of damages are commenced within 12 months of termination.

26.3 For the avoidance of doubt, if the Deposit is paid by Deposit Bond or Bank Guarantee in accordance with clause 3, and the Seller is entitled to terminate in accordance with clause 26.1, the Buyer acknowledges that the Seller is entitled to, and may, call upon the Deposit Bond or Bank Guarantee immediately after serving the termination notice.

27 TERMINATION – SELLER DEFAULT

27.1 If the Seller does not comply with a Notice to Complete or a Default Notice or is otherwise in breach of an essential term the Buyer may by notice served on the Seller either:

(a) terminate and seek damages; or

(b) enforce without further notice any other rights and remedies available to the Buyer.

28 RESCISSION

28.1 If this Contract is rescinded, it is rescinded from the beginning, and unless the parties otherwise agree:

(a) the Deposit and all other money paid by the Buyer must be refunded to the Buyer immediately without any further authority being necessary; and

(b) neither party is liable to pay the other any amount for damages, costs or expenses.

29 DAMAGES FOR DELAY IN COMPLETION

29.1 If Completion does not occur by the Date for Completion due to the default of either party, the party who is at fault must pay the other party as liquidated damages on Completion:

(a) interest on the Price at the rate of 10% per annum calculated on a daily basis from the date 7 days after the Date for Completion to Completion;

and

(b) the amount of $660 (including GST) to be applied towards any legal costs and disbursements incurred by the party not at default if Completion occurs later than 7 days after the Date for Completion.

29.2 The party at fault must pay the amount specified in clause 29.1 in addition to any other damages to which the party not at fault is entitled both at law and under this Contract.

29.3 The parties agree that:

(a) the amount of any damages payable under clauses 29.1(a) to the party not in default is a genuine and honest pre-estimate of loss to that party for the delay in Completion, and

(b) the damages must be paid on Completion.

30 FOREIGN BUYER

30.1 The Buyer warrants the Commonwealth Treasurer cannot prohibit and has not prohibited the transfer of the Lease under the *Foreign Acquisitions and Takeovers Act 1975*.

30.2 This clause is an essential term.

31 GST

31.1 The Buyer and the Seller agree that the Margin Scheme applies to the Supply of the Land.

31.2 The Seller warrants that it can use the Margin Scheme and promises that it will.

32 INSOLVENCY

32.1 If the Buyer suffers an Insolvency Event, the Buyer must immediately notify the Seller in writing.

32.2 If the Seller receives notice that the Buyer has suffered an Insolvency Event (either pursuant to clause 32.1 or by some other means), the Seller may terminate this Contract and clause 26 applies.

33 POWER OF ATTORNEY

33.1 Any party who signs this Contract or any document in connection with it under a power of attorney must, on request and without cost, provide the other party with a true copy of the registered power of attorney.

34 NOTICES CLAIMS AND AUTHORITIES

34.1 Notices, claims and authorities required or authorised by this Contract must be in writing.

34.2 To serve a notice a party must:

(a) leave it at; or

(b) send it by a method of post requiring acknowledgement of receipt by the addressee to,

the address of the person to be served as stated in the Schedule or as notified by that person to the other as that person's address for service under this Contract; or

(c) serve it on that party's solicitor in any of the above ways; or

(d) by delivering it to an appropriate place in the facilities of a document exchange system in which the recipient solicitor has receiving facilities (and in the latter case service is deemed effected on the Working Day following delivery); or

(e) send it by facsimile to a party's solicitor, and unless it is not received a notice is taken to have been received at the time shown in the transmission report that the whole facsimile was sent; or

(f) send it by email to an email address of the party's solicitor (whether to the solicitor's firm generally or specifically to the practitioner specified on the Schedule) as notified from time to time and, unless the receiving party indicates by immediate automatic response that the email address is unattended, the notice is taken to have been received at the time it was sent and if not sent before 5:00pm on a Working Day, on the next Working Day.

34.3 A party's solicitor may give a notice, claim or authority on behalf of that party.

34.4 If a notice is served in accordance with clause 34.2(a), the notice is taken to have been received on the day that it is delivered or, if not delivered before 5:00pm on a Working Day, on the next Working Day.

34.5 If a notice is served in accordance with clause 34.2(b), the notice is taken to have been received on the day 2 Working Days after it was posted.

35 BUSHFIRE PROTECTION

35.1 The Buyer acknowledges that the Land may be affected by legislation and regulations in connection with bushfire protection and that those requirements are subject to change.

36 CAT CONTAINMENT

36.1 The Land is part of an area which is declared to be a cat curfew area under the *Domestic Animals Act 2000* (ACT) and cats located within areas declared to be cat curfew areas must be confined to their keeper's or carer's premises at all times.

37 GEOTECHNICAL INFORMATION

37.1 The Seller discloses the existence of the Site Classification Certificate which the Buyer acknowledges is available for its examination.

37.2 The Buyer cannot make a claim or objection or rescind or terminate or make a claim for compensation under clause 24 of this Contract in respect of any matter set out in the Site Classification Certificate.

38 RIVER CORRIDOR CONSERVATION MANAGEMENT TRUST

38.1 The appropriate conservation management of the heritage and ecological value of the Murrumbidgee river corridor is of critical importance to its long term health and sustainability.

38.2 The Seller and/or Development Manager may establish a body (**River Corridor Conservation Management Trust**) to undertake that management, subject to receipt of funds under clause 38.3.

38.3 The Buyer acknowledges that the ACT Government may, as a means of ensuring ongoing funding of the River Corridor Conservation Management Trust, impose a levy (or similar charge) on the Land.

39 PRIVACY

39.1 The Buyer consents to the collection, use and disclosure of the Personal Information of the Buyer by the Seller and Development Manager:

(a) for entering into, administering and completing this Contract;

(b) for planning and product development by the Seller and Development Manager;

(c) to comply with the Seller's obligations or to enforce its rights under this Contract;

(d) to owners of adjoining land to enable them to deal with the Buyer concerning any development of other work which they wish to undertake on their land (including disclosure of Personal Information to contractors to assist adjoining land owners to comply with their obligations and to enforce their rights in relation to fencing);

(e) to surveyors, engineers and other parties who are engaged by the Seller or the Development Manager to carry out works which may affect the Land;

(f) to service providers engaged by the Seller or Development Manager, such as legal advisors, financial advisors, environmental consultants, providers of the Household Energy Package, market research organisations, mail houses and delivery companies;

(g) to any third party who has a right or entitlement to share in the monies paid or payable to the Seller under this Contract; and

(h) in other circumstances where the Seller or Development Manager is legally entitled, obliged or required to do so, including any disclosure which is permitted or authorised under the Privacy Act.

39.2 The Buyer acknowledges that they have received, read, and understood the Land Privacy Policy and Land Collection Notice, and accepts that any information collected by the Seller pursuant to this Contract, or previously in relation to this Contract, is held and used in accordance with the Land Privacy Policy and Land Collection Notice.

39.3 The Buyer consents to the Seller’s use of any personal information provided by the Buyer to reasonably fulfil the purpose of this Contract and any of its functions, including disclosure of personal information to the ACT Revenue Office and other ACT and Commonwealth government agencies.

40 MANDATORY SUSTAINABILITY REQUIREMENTS

40.1 The Buyer agrees, in compliance with the Housing Development Requirements, to comply with the Sustainability Requirements.

40.2 The Buyer acknowledges that the Housing Development Requirements contemplate the Seller nominating one or more suppliers which the Buyer can select for the supply and installation of a Household Energy Package to assist the Buyer in achieving compliance with the Sustainability Requirements.

40.3 The Buyer acknowledges that the Seller is not responsible for the acts or performance of any supplier identified in the Sustainability Requirements.

41 LAND DESCRIPTION

41.1 The Seller advises and the Buyer acknowledges that the description of the Land in the Housing Development Requirements and associated documents may be by way of alphabetical block and section references.

41.2 Numerical block and section references in the Schedule have issued for the Land and the Land reference includes the former alphabetical block and section references for the Land.

42 SERVICE PROVIDERS

42.1 The Seller is not a Utility Service provider and any works undertaken on the Land by the Seller do not include actual connections to services, substations, transformers or any other thing that may be required for such connections.

42.2 The Buyer will be responsible for contacting all relevant service providers for Utility Services as soon as practicable to arrange servicing of the Land by those service providers to avoid delays to their Development caused as a consequence of being unable to access a Utility Service.

43 DIRECTOR'S GUARANTEE

43.1 Where the Buyer is a corporation, all directors of that corporation must guarantee that corporation's performance of its obligations under this Contract.

43.2 The guarantee is to be in the form attached as Annexure C.

44 FOREIGN RESIDENT WITHHOLDING TAX

44.1 In this clause 44, the following definitions apply:

ATO means the Australian Taxation Office and includes the Commissioner for Taxation;

CGT Asset has the meaning in the *Income Tax Assessment Act 1997 (Cth)*;

Clearance Certificate means a certificate issued under section 14-220 of the Withholding Law that covers the date of Completion;

Relevant Percentage means the percentage amount stated in section 14-200(3)(a) and 14-205(4)(a) of the Withholding Law;

Relevant Price means the higher of:

(a) the Price (including GST); and

(b) the market value of the CGT Assets sold under this Contract;

as at the Date of this Contract;

Variation Certificate means a certificate issued under section 14-235 of the Withholding Law that covers the date of Completion;

Withholding Amount means subject to clauses 44.6 and 44.7 the Relevant Percentage of the first element of the CGT Asset's cost base (for all CGT Assets sold under this Contract) as at the Date of this Contract; and

Withholding Law means Subdivision 14-D of Schedule 1 of the *Taxation Administration Act 1953* (Cth) and associated provisions.

44.2 If the Relevant Price is less than the dollar amount stated in section 14-215(1)(a) of the Withholding Law as at the Date of this Contract, the parties acknowledge that there are no obligations under the Withholding Law.

44.3 If Clearance Certificates for all the Sellers are provided to the Buyer prior to Completion, the parties acknowledge that there are no obligations under the Withholding Law.

44.4 If neither clause 44.2 or 44.3 apply, then:

(a) the Seller must provide to the Buyer any information required to enable the Buyer to comply with clause 44.4(b)(i), within 5 days of written request from the Buyer;

(b) the Buyer must:

(i) lodge a purchaser payment notification form with the ATO; and

(ii) give evidence of compliance with clause 44.4(b)(i) to the Seller;

no later than 5 days before the Date for Completion;

(c) the Seller irrevocably instructs the Buyer to draw as part of the Price, and the Buyer must draw and retain on Completion, an unendorsed bank cheque payable to the ATO for the Withholding Amount; and

(d) the parties must both, on the date of Completion, attend the offices of an authorised collection agent of the ATO to deposit the bank cheque referred to in clause 44.4(c) in payment of the Withholding Amount following Completion.

44.5 If clause 44.4 applies and the parties do not comply with clause 43.4(d):

(e) the Buyer indemnifies the Seller for any loss or damage resulting from the Buyer's delay in remitting and/or failure to remit the Withholding Amount to the ATO; and

(f) the Buyer charges the Land (for the benefit of the Seller) with the Buyer's obligations under this clause 44.5.

44.6 Where the Seller gives the Buyer a Variation Certificate prior to Completion, the Withholding Amount is the amount stated in the Variation Certificate.

44.7 Where Clearance Certificates for some but not all of the Sellers are provided to the Buyer prior to Completion, then the Withholding Amount is reduced by the same percentage as the percentage ownership of the Land of the Sellers that are subject to a Clearance Certificate.

44.8 Where a Clearance Certificate is provided by a Seller to the Buyer, the Seller warrants to the Buyer that the Seller is the entity referred to in the Clearance Certificate and is the relevant taxpayer for capital gains tax payable on the sale of the CGT Assets sold under this Contract.

Warning: The following clauses 45.1 to 45.14 are subject to the Withholding Law, and do not encompass all obligations under the Withholding Law.

45 RESIDENTIAL WITHHOLDING TAX

45.1 In this clause 45 the following words have the following meanings:

ATO means the Australian Taxation Office, and includes the Commissioner for Taxation;

RW Amount means the amount which must be paid under section 14-250 of the Withholding Law;

RW Amount Information means the information set out in the table entitled "RW Amount (Residential Withholding Payment) — Further Details" set out in this Contract; and as provided or updated under this Contract.

RW Percentage means the percentage amount stated in section 14-250(6), (8) and (9) of the Withholding Law, as applicable to the supply of the Land from the Seller to the Buyer; and

Withholding Law means Subdivision 14 of Schedule 1 of the *Taxation Administration Act 1953* (Cth) and associated provisions.

45.2 The Seller must provide the Buyer with the RW Amount Information no later than 28 days prior to the Date for Completion.

45.3 If the 'Buyer required to make a withholding payment?' option on the Schedule is selected 'no' or if no selection is made, the Seller warrants to the Buyer that the Buyer is not required to make a payment under section 14-250 in relation to the supply of the Land from the Seller to the Buyer.

45.4 The following clauses 45.5 to 45.14 inclusive only apply if the 'Buyer required to make a withholding payment?' option on the Schedule is selected 'yes'.

45.5 Subject to any adjustments to the Price or non-monetary consideration that may arise after the date that the RW Amount Information is provided in accordance with clause 45.2 and which affect the RW Amount, the Seller warrants to the Buyer on the date that the RW Amount Information is provided to the Buyer that the Seller has provided the Buyer with the information required under section 14-255 of the Withholding Law in relation to the supply of the Land from the Seller to the Buyer, and that this information is true and correct to the Seller's knowledge.

45.6 The Buyer must provide the Seller with a copy of the 'GST property settlement withholding notification online form' confirmation email (or emails, if applicable) issued to the Buyer by the ATO at least 10 Working Days prior to the Date for Completion.

45.7 The Buyer must provide the Seller with evidence of submission by the Buyer to the ATO of the 'GST property settlement date confirmation online form', with such evidence to be provided prior to or on Completion.

45.8 The Seller irrevocably instructs the Buyer to draw as part of the Price, and the Buyer must draw and give to the Seller on Completion, an unendorsed bank cheque payable to the ATO for the RW Amount.

45.9 The Seller must forward the unendorsed bank cheque provided under clause 45.8 to the ATO within 5 Working Days following Completion and provide the Buyer with evidence of payment of the RW Amount to the ATO.

45.10 The Buyer and Seller must comply with all ATO requirements in relation to the Withholding Law and must also assist and co-operate with each other in order to ensure that those requirements are met. If necessary to give effect to this clause, the Buyer appoints the Seller as its agent of the purpose of completing any notification required to be given by the Buyer to the ATO.

45.11 The Seller may provide the Buyer with updated RW Amount Information at any time, and (if necessary) on more than one occasion, prior to Completion. If the Seller provides the Buyer with updated RW Amount Information in accordance with this clause, the Buyer must, within 3 Working Days of receipt of the RW Amount Information, provide the Seller with a copy of the

'GST property settlement withholding notification online form' confirmation email (or emails, if applicable) issued to the Buyer by the ATO including the updated RW Amount Information.

45.12 The Seller indemnifies the Buyer against the amount of any penalties or interest charges imposed by the ATO on the Buyer (or the relevant recipient of the supply) arising from any failure by the Seller to forward the unendorsed bank cheque required by clause 45.8 to the ATO.

Potential Residential Land

45.13 If the 'Subdivision of potential residential land?' option on the Schedule is selected 'yes' and the Buyer (or the relevant recipient for GST purposes) is:

(a) registered for GST purposes; and

(b) acquiring the Land for a creditable purpose;

the Buyer must provide the Seller with a statement to that effect on the earlier of:

(c) 10 Working Days before the Date for Completion; or

(d) 20 Working Days after the Date of this Contract.

45.14 Where the Buyer has provided the statement referred to in clause 45.13 the Buyer indemnifies the Seller against the amount of any penalties or interest charges imposed by the ATO on the Seller (or the relevant entity making the supply of the Land).

46 DEFINITIONS

46.1 Definitions appear in the Schedule and as follows:

ACT Revenue Office means the ACT Revenue Office of the Chief Minister, Treasury and Economic Development Directorate**;**

Affecting Interest means any mortgage, Encumbrance, lease, lien, charge, notice, order, caveat, writ or other interest;

Application to Register a Crown Lease means the prescribed form approved under the *Land Titles Act 1925* (ACT) - Form 31 – ACL - Application to register crown lease, or any form that replaces it;

Balance of the Price means the Price less the Deposit;

Bank Guarantee means a bank guarantee issued by a bank operating in Australia in a form satisfactory to the Seller;

Completion means the time at which this Contract is completed;

Compliance Bond means the amount set out in the Schedule;

Contract means the Schedule, terms and conditions and any annexure, additional clauses and attachments forming part of this Contract;

Covenant includes restrictive covenant;

Default Notice means a notice in accordance with clauses 25.5 and 25.6;

Deposit means the deposit forming part of the Price specified in the Schedule;

Deposit Bond means a deposit insurance bond issued to the Seller at the request of the Buyer in a form satisfactory to the Seller;

Development has the meaning in the Planning Act;

Development Manager means Riverview Projects (ACT) Pty Ltd ACN 165 870 539, ABN 30 165 870 539;

Dwelling Completion means the point at which all of the following have been satisfied in relation to the Land:

(a) a certificate of fitness for occupancy or use has issued;

(b) a certificate of compliance has issued;

(c) the dwelling erected on the Land corresponds with the one for which endorsement was given by the Development Manager under clause 7.4;

(d) clause 10 has been complied with and there is no damage to any public domain (as identified in clause 10.4);

(e) clause 40 has been complied with; and

(f) the Buyer has otherwise complied with the requirements of this Contract;

Encumbrance includes an unregistered or statutory encumbrance, but does not include an encumbrance that is to be released or discharged on or before Completion;

Front Landscaping means the Seller providing landscaping to the front of the dwelling constructed on the Land selected, with such landscaping to be in compliance with the Housing Development Requirements;

Front Landscaping Application Form means a form described as such and made available to the Buyer prior to Dwelling Completion;

GST has the meaning ascribed to it under the GST Law and, where appropriate, includes voluntary and Notional GST. Expressions used in this Contract of Sale which are defined in the GST Law have the same meaning as given to them in the GST Law;

GST Law means the *A New Tax System (Goods and Services Tax) Act 1999* (Cth);

Household Energy Package includes the mandatory items of photo voltaic arrays, inverter and demand management system and such other items as identified in the Housing Development Requirements;

Housing Development Requirements means the Housing Development Requirements in relation to Neighbourhood 1 available at www.Ginninderry.com as amended from time to time;

Improvements means the buildings, structures and fixtures erected on and forming part of the Land;

Income means the rents and profits derived from the Land;

Insolvency Event means the following:

(a) where the Buyer is a natural person and:

(i) the Buyer authorises a registered trustee or solicitor to call a meeting of his or her creditors and enters into a deed of assignment or deed of arrangement or a composition with any of his or her creditors;

(ii) a third party who holds a security interest in the assets of the Buyer enters into possession, or takes control of those assets, or attempts by any means to do the same; or

(iii) the Buyer commits an act of bankruptcy; or

(b) where the Buyer is a body corporate and:

(i) the Buyer becomes, or attempts are made for the Buyer to become an externally administered body corporate in accordance with the *Corporations Act 2001* (Cth); or

(ii) a controller (as defined by the *Corporations Act 2001* (Cth)) is appointed, or attempts are made to have a controller appointed for any of the Buyer's assets;

Land means the land described in the Schedule and to be the subject of the Lease;

Land Charges means rates, land rent, land tax and other taxes and outgoings of a periodic nature in respect of the Land;

Land Collection Notice means the collection notice provided by the Suburban Land Agency Buyer in accordance with the Information Privacy Act 2014 (ACT) and which can be found at www.suburbanland.act.gov.au;

Land Privacy Policy means the privacy policy provided by the Suburban Land Agency to the Applicant in accordance with the Information Privacy Act 2014 (ACT) and which can be found at www.suburbanland.act.gov.au;

Lease means a Crown lease that is not subject to the provisions of the *Land Rent Act 2008* (ACT) that will be granted in accordance with the Planning Act in a form similar to the Specimen Lease and which may, where the Land is affected by an easement identified in the Housing Development Requirements, include an annexure or additional provisions detailing the terms of the easement;

Margin Scheme has the meaning given to that term in the GST Law;

Notice to Complete means a notice in accordance with clauses 25.1 and 25.2 requiring a party to complete;

Notional GST means, where the supplier is the Commonwealth and an obligation exists to make voluntary or notional GST payments under section 177-1 of the GST Law, those voluntary or notional payments are made by or on behalf of the Commonwealth. For the avoidance of doubt Notional GST amounts will be calculated as if the GST Law applies to the relevant supplies;

Personal Information has the meaning given to it in the Privacy Act;

Planning Act means the *Planning and Development Act 2007* (ACT);

Planning and Land Authority means the body corporate established in accordance with the Planning Act;

Privacy Act means the *Privacy Act 1988* (Cth) and any ancillary rules, regulations, guidelines, orders, directives, codes of conduct or practice or other instrument made or issued thereunder, including:

(a) any consolidation, amendment re-enactment or replacement of any of them or the Privacy Act, and

(b) the National Privacy Principles under the Privacy Act;

Property Act means the *Civil Law (Sale of Residential Property) Act 2003* (ACT);

Site Classification Certificate means the site classification certificate with respect to the Land available at www.Ginninderry.com or as otherwise advised by the Seller from time to time.

Specimen Lease means the specimen Crown lease annexed to this Contract at Annexure B;

Substance means any substance or thing which is or may be an emission to the environment or harmful to the environment or the health or safety of any person or may cause damage to property and includes:

(a) asbestos;

(b) polychlorinated biphenyls;

(c) heavy metals;

(d) chemicals;

(e) contaminants; and

(f) any other matter whether solid, liquid or gaseous form, or whether naturally occurring or man-made;

Sustainability Requirements means the minimum sustainability requirements in relation to the dwelling to be constructed on the Land as set out in the sustainability requirements part of the Housing Development Requirements and includes the Household Energy Package;

Territory Plan means the *Territory Plan 2008* (ACT) as amended and varied from time to time;

Utility Services includes drainage, electricity, garbage collection, gas, sewerage, telecommunications (including NBN) or water; and

Working Days has the meaning given to it by the *Legislation Act 2001* (ACT).

47 INTERPRETATION

47.1 In this Contract:

(a) a reference to the Seller or to the Buyer includes the executors, administrators and permitted assigns of any of them, if an individual, and the successors or permitted assigns of any of them, if a corporation;

(b) the singular includes the plural, and the plural includes the singular;

(c) a reference to a person includes a body corporate;

(d) a term not otherwise defined has the meaning in the *Legislation Act 2001* (ACT); and

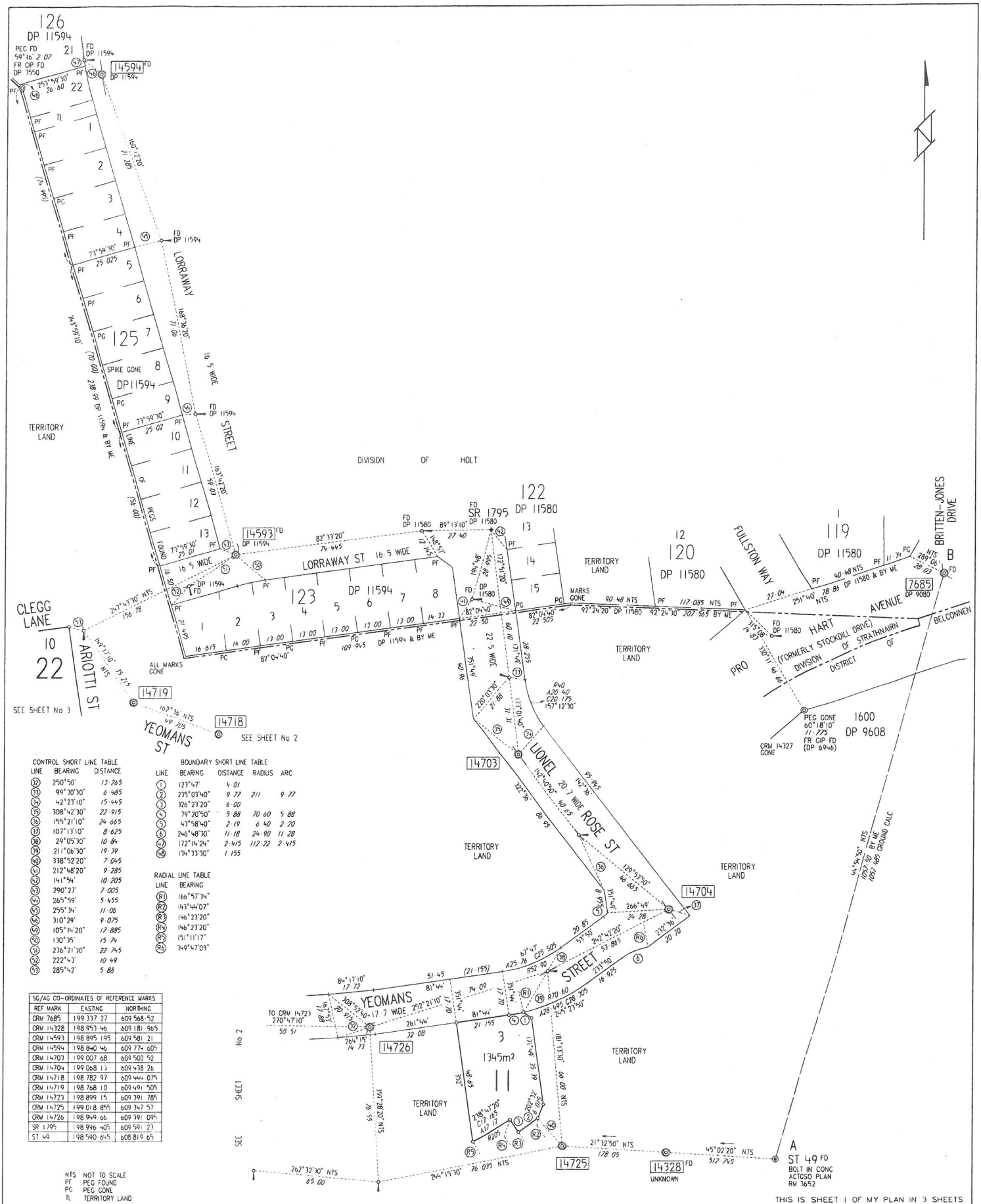
(e) a reference to an Act includes a reference to any subordinate legislation made under it or any Act which replaces it.

47.2 Headings are inserted for convenience only and are not part of this Contract.

47.3 If the time for something to be done or to happen is not a Working Day, the time is extended to the next Working Day, except in the case of clause 2.1.

47.4 If there is more than one buyer or more than one seller the obligations which they undertake bind them jointly and individually.

ANNEXURE A – DEPOSITED PLAN



CONTROL SHORT LINE TABLE		
LINE	BEARING	DISTANCE
(32)	250°50'	13.265
(33)	99°30'30"	6.485
(34)	42°23'10"	15.445
(35)	308°42'30"	22.915
(36)	155°21'10"	24.665
(37)	107°13'10"	8.625
(38)	29°05'30"	10.84
(39)	211°06'30"	19.39
(40)	338°52'20"	7.045
(41)	212°48'20"	9.285
(42)	141°54'	10.205
(43)	290°27'	7.005
(44)	265°59'	5.455
(45)	255°34'	11.06
(46)	310°29'	9.075
(49)	105°14'20"	17.885
(50)	130°35'	15.74
(51)	236°21'30"	22.745
(52)	222°43'	10.49
(53)	285°42'	5.88

BOUNDARY SHORT LINE TABLE				
LINE	BEARING	DISTANCE	RADIUS	ARC
(1)	123°47'	4.01		
(2)	235°03'40"	9.77	211	9.77
(3)	326°23'20"	6.00		
(4)	79°20'50"	5.88	70.60	5.88
(5)	43°58'40"	2.19	6.40	2.20
(6)	246°48'30"	11.18	24.90	11.28
(47)	172°14'24"	2.415	112.22	2.415
(48)	134°33'30"	1.155		

RADIAL LINE TABLE	
LINE	BEARING
(R1)	166°57'34"
(R2)	143°44'07"
(R3)	146°23'20"
(R4)	146°23'20"
(R5)	151°11'17"
(R6)	349°47'09"

SG/AG CO-ORDINATES OF REFERENCE MARKS		
REF MARK	EASTING	NORTHING
CRM 7685	199 337.27	609 568.52
CRM 14328	198 953.46	609 181.965
CRM 14593	198 895.195	609 581.21
CRM 14594	198 840.46	609 774.605
CRM 14703	199 007.68	609 500.52
CRM 14704	199 068.13	609 438.26
CRM 14718	198 782.97	609 444.075
CRM 14719	198 768.10	609 491.505
CRM 14723	198 899.15	609 391.785
CRM 14725	199 018.855	609 347.57
CRM 14726	198 949.66	609 391.095
SR 1795	198 996.405	609 591.23
ST 49	198 590.645	608 819.65

NTS NOT TO SCALE
PF PEG FOUND
PG PEG GONE
TL TERRITORY LAND

REFERENCE MARKS
- ◎ Denotes G I P ~~in road 1 83 radially from T P~~
- ◉ - ~~G B 1 83 T P~~
- ◎ - PLAQUE IN KERB
- ✦ - DEEP DRIVEN ROD
- ⚲ - DH&W IN KERB
(Except as otherwise shown)

NOTE:
All easements are 2.5 metres wide (Except as otherwise shown)

Azimuth: A–B (Strom)

Field Books:

SURVEYOR'S REFERENCE: 15100-04

I, PETER WILLIAM MAYBERRY of MAIL McDONALD BARNSLEY Pty Ltd PO BOX 54 JAMISON ACT 2614 a surveyor registered under the Surveyors Act 2007 hereby certify that the survey represented on this plan is accurate and has been made in accordance with the Surveyors Practice Directions and was completed on 21 MARCH 2019

(Signature) Peter William Mayberry

Surveyor, Registered under the Surveyors Act 2007 — 18 JUNE 2019

I certify that this plan is the plan prepared in accordance with the Districts Act 2002

19 June 2019

Surveyor-General of the ACT

PLAN OF

BLOCK 3 SECTION 11, BLKS 1, 8 SEC 12,
BLKS 1–5 & 8–9 SEC 13, BLKS 1–4 & 6–7 SEC 14,
BLKS 1–3 SEC 15, BLKS 6–10 SEC 16, BLKS 1–4 SEC 18,
BLKS 1–3 SEC 19 & BLKS 1–12 SEC 22

DIVISION: STRATHNAIRN
DISTRICT: BELCONNEN
AUSTRALIAN CAPITAL TERRITORY

SCALE 1:800

0 10 20 40 60 METRES

Deposited in the office of the Registrar of Titles at Canberra in the Australian Capital Territory at 12:08 pm, 20/06/2019

Approved
David Snowden
Registrar-General

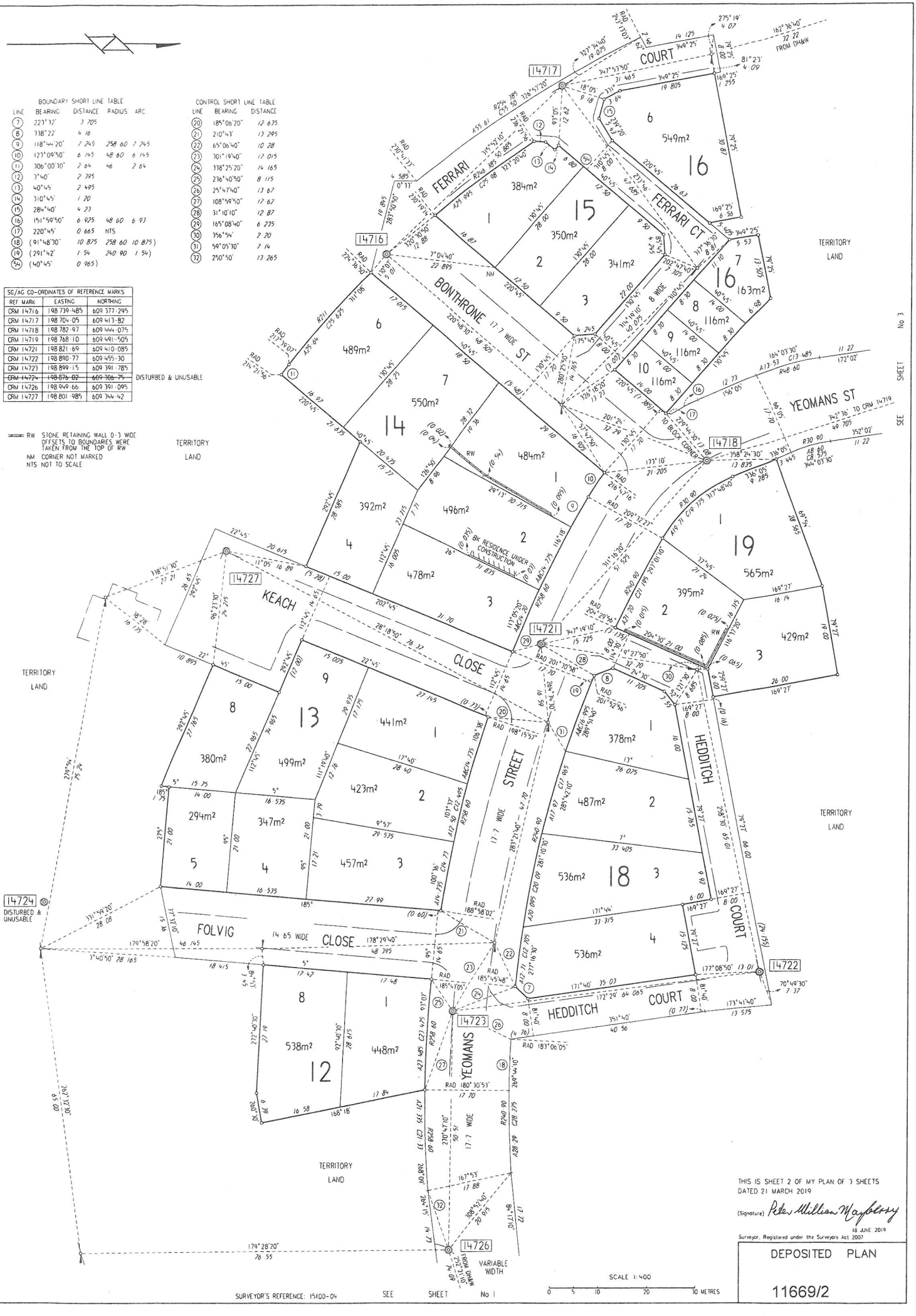
Registrar of Titles

DEPOSITED PLAN

11669/1

THIS IS SHEET 1 OF MY PLAN IN 3 SHEETS

X21608



THIS IS SHEET 2 OF MY PLAN OF 3 SHEETS
DATED 21 MARCH 2019

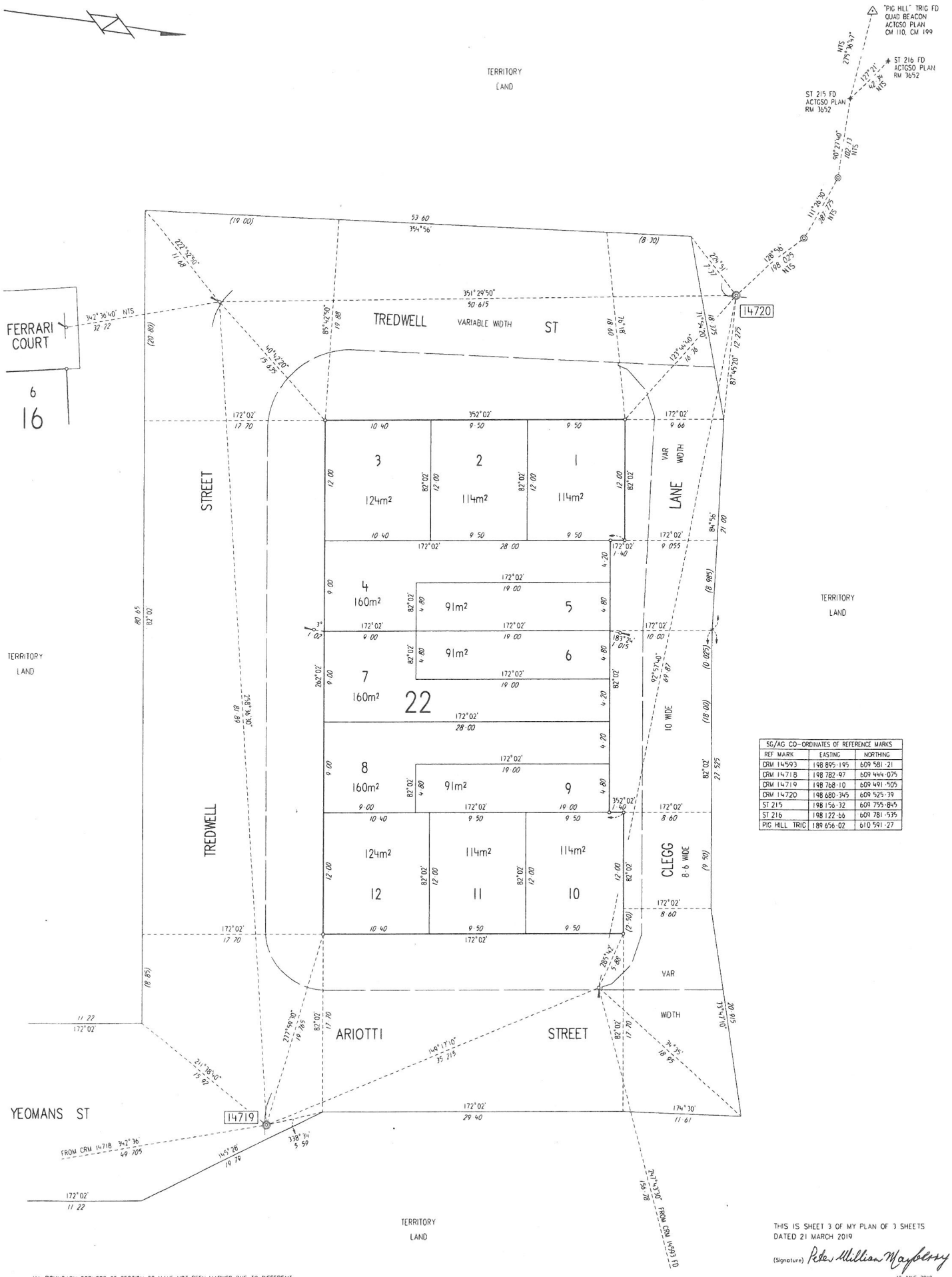
(Signature) Peter Millican Mapperson

18 JUNE 2019

Surveyor, Registered under the Surveyors Act 2007

DEPOSITED PLAN

11669/2



SG/AG CO-ORDINATES OF REFERENCE MARKS		
REF. MARK	EASTING	NORTHING
CRM 14593	198 895·195	609 581·21
CRM 14718	198 782·97	609 444·075
CRM 14719	198 768·10	609 491·505
CRM 14720	198 680·345	609 525·39
ST 215	198 156·32	609 755·845
ST 216	198 122·66	609 781·535
PIG HILL TRIG	189 656·02	610 591·27

ALL BOUNDARY CORNERS OF SECTION 22 HAVE NOT BEEN MARKED DUE TO DIFFERENT LAND CUT PADS AND HOUSING DRAINAGE SERVICES PRESENT WITHIN THIS SECTION SURROUNDED BY CONCRETE PAVEMENT

NTS NOT TO SCALE

SURVEYOR'S REFERENCE: 15100-04

SCALE 1:200

0 2 4 6 10 15 METRES

THIS IS SHEET 3 OF MY PLAN OF 3 SHEETS
DATED 21 MARCH 2019

(Signature) Peter Millican Mayberry

18 JUNE 2019

Surveyor, Registered under the Surveyors Act 2007

DEPOSITED PLAN

11669/3

ANNEXURE B - SPECIMEN LEASE

This is a market value lease - s238(2) (a) (ii) Planning and Development Act 2007

LEASE No

Volume | Folio

CONDITIONS APPLICABLE

MOP (No.) | Annexure

SPECIMEN ONLY

SPECIMEN ONLY

AUSTRALIAN CAPITAL TERRITORY

CROWN LEASE

PLANNING AND DEVELOPMENT ACT 2007

AUSTRALIAN CAPITAL TERRITORY (PLANNING & LAND MANAGEMENT) ACT 1988 (C'th) ss. 29,30 & 31

THE PLANNING AND LAND AUTHORITY ON BEHALF OF THE COMMONWEALTH OF AUSTRALIA IN EXERCISING ITS FUNCTIONS GRANTS TO THE LESSEE THE LAND FOR THE TERM AND SUBJECT TO THE PROVISIONS SET OUT BELOW.

THE MEMORANDUM OF PROVISIONS (MOP) No. *2,000,050* REGISTERED IN THE REGISTRAR-GENERAL'S OFFICE AND/OR ANY PROVISIONS SET OUT IN ANY ANNEXURE ARE PART OF THIS LEASE.

1. LAND

DISTRICT/DIVISION	SECTION	BLOCK	DEPOSITED PLAN	APPROXIMATE AREA
				square metres

2. LESSEE'S NAME AND ADDRESS

3. FORM OF TENANCY

4. TERM

GRANT DATE: TERM IN YEARS: 99 FROM THE COMMENCEMENT DATE

COMMENCEMENT DATE: EXPIRY DATE:

5. PURPOSE

SINGLE DWELLING HOUSING.

6. RESERVATIONS AND STATUTORY RESTRICTIONS

The statutory restriction(s) is/are:
Section 298 of the Planning and Development Act 2007.

7. VARIATIONS TO MEMORANDUM OF PROVISIONS

Not Applicable

THIS DOCUMENT MUST BE LODGED AT THE REGISTRAR-GENERAL'S OFFICE FOR REGISTRATION

8. EXECUTION

SIGNED BY

SIGNATURE OF WITNESS

SIGNATURE OF LESSEE

NAME OF WITNESS (BLOCK LETTERS)

SIGNED BY A DELEGATE AUTHORISED TO EXECUTE THIS LEASE ON BEHALF OF THE COMMONWEALTH:

SIGNATURE

SIGNATURE OF WITNESS

NAME OF SIGNATORY (BLOCK LETTERS)

OFFICE USE ONLY

EXAMINED	
VOLUME: FOLIO	
REGISTERED:	

DATE:

ACT Government
Justice and Community Safety

LAND TITLES
OFFICE OF REGULATORY SERVICES
ACT Justice and Community Safety Directorate

ANNEXURE

Land Titles Act 1925

Form 029 - ANN

TITLE AND LAND DETAILS				
Volume & Folio	**District/Division**	**Section**	**Block**	**Unit**

ANNEXURE TO (Insert dealing type)	TOTAL NUMBER OF PAGES IN ANNEXURE
Crown Lease	2

1. The Authority, on behalf of the Commonwealth, grants over that part of the land ("Land") identified as a services easement on the Deposited Plan an easement ("Easement") in favour of the relevant provider (referred to as the "service provider");

2. The service provider may:

   (1) provide, maintain and replace services supplied by that service provider through the Land within the site of the Easement; and

   (2) do anything reasonably necessary for that purpose, including without limitation:

      (a) entering or passing through the Land;

      (b) taking anything on to the Land; and

      (c) carrying out work, including without limitation, constructing, placing, repairing or maintaining pipes, poles, wires, cables, conduits, structures and equipment.

3. In exercising the powers in paragraph 2, the service provider must take all reasonable steps to:

   (1) ensure that the work carried out on the Land causes as little disruption, inconvenience and damage as is practicable; and

   (2) ensure that the Land is restored as soon as practicable to a condition that is similar to its condition before the work was carried out.

4. Paragraph 3(2), does not require the service provider to restore:

   (1) the Land to a condition that would result in:

      (a) an interference with:

         (i) any service on or through the Land; or

         (ii) access to any service on or through the Land; or

      (b) a contravention of a law of the Territory; or

(2) any building or structure placed or constructed on any part of the Land comprising the Easement.

5. The Lessee must not place or construct, nor permit to be placed or constructed, a building or structure or any part of a building or structure on any part of the Land comprising the Easement UNLESS written advice from the service provider is obtained;

6. For the purposes of the Easement, "services", includes, without limitation, the supply of water, gas, electricity and discharge or drainage of water, stormwater and sewage.

7. Nothing in this clause diminishes or affects any rights or powers of a service provider conferred under any statute, regulation or law.

AUSTRALIAN CAPITAL TERRITORY
LAND TITLES ACT 1925
Section 103A

Memorandum Of Provisions

Memorandum of Provisions No.2,000,050

1. **INTERPRETATION**

IN THIS LEASE, unless the contrary intention appears, the following terms mean:

1.1 'Act' - the Planning and Development Act 2007;

1.2 'Authority' – the Planning and Land Authority established by section 10 of the Planning and Development Act 2007;

1.3 'Building' - any building, structure or improvement on or under the Land;

1.4 'Class' - for a building or structure, means the class of building or structure under the building code as defined in the Building Act 2004;

1.5 'Commencement Date' - the Commencement Date specified in item 4;

1.6 'Commonwealth' – the Commonwealth of Australia;

1.7 'Dwelling' -

(a) means a Class 1 building, or a self-contained part of a Class 2 building, that:

(i) includes the following that are accessible from within the building, or the self-contained part of the building:

(1) not more than 2 kitchens;

(2) at least 1 bath or shower;

(3) at least 1 toilet pan; and

(ii) does not have access from another building that is either a Class 1 building or the self-contained part of a Class 2 building; and

(b) includes any ancillary parts of the building and any Class 10a buildings associated with the building;

1.8 'Land' - the Land specified in item 1;

1.9 'Lease' - the Crown lease incorporating these provisions;

1.10 'Lessee' includes:

(a) where the Lessee is or includes a person, the executors, administrators and assigns of that person; and

(b) where the Lessee is or includes a corporation, the successors and assigns of that corporation;

1.11 'Multi-unit housing' means the use of land for more than one dwelling and includes but is not limited to dual occupancy housing;

1.12 'Premises' - the Land and any Building at any time on the Land;

1.13 'Purpose' - the Purpose specified in item 5;

1.14 'Single dwelling housing' means the use of land for residential purposes for a single dwelling only;

1.15 'Territory':

(a) when used in a geographical sense, the Australian Capital Territory; and

(b) when used in any other sense the body politic established by section 7 of the Australian Capital Territory (Self-Government) Act 1988 (C'th);

1.16 Where the Lessee comprises two or more persons or corporations, an agreement by the Lessee binds them jointly and individually;

1.17 The singular includes the plural and vice versa;

1.18 A reference to one gender includes the other genders;

1.19 A reference in this lease to any statute or statutory provision shall include a reference to any statute or statutory provision that amends, extends, consolidates or replaces the statute or statutory provision and to any other regulation, instrument or other subordinate legislation made under the statute;

1.20 A reference to an item is a reference to the corresponding item in the Lease.

2. LESSEE'S OBLIGATIONS

The Lessee must:

RENT

2.1 pay to the Authority the rent of 5 cents per annum if and when demanded;

BUILDING SUBJECT TO APPROVAL

2.2 not, without the prior written approval of the Authority, except where exempt by law, construct any Building, or make any structural alterations in or to any Building;

COMPLETE CONSTRUCTION

2.3 within twenty-four (24) months from the Commencement Date or within such further time as may be approved in writing by the Authority, complete construction of an approved development on the Land as approved by the Authority at a cost of not less than one hundred and eighty thousand dollars ($180,000) per Dwelling;

UNDERGROUND FACILITIES

2.4 ensure that facilities for electrical and telephone cables are installed underground to a standard acceptable to the Authority;

PURPOSE

2.5 use the Land for the Purpose;

PRESERVATION OF TREES

2.6 during the period allowed for construction, not damage or remove trees identified in a development approval for retention or to which the Tree Protection Act 2005 applies, without the prior written approval of the Territory;

REPAIR AND MAINTAIN

2.7 repair and maintain the Premises to the satisfaction of the Authority;

RIGHT OF INSPECTION

2.8 subject to the Act, permit anyone authorised by the Authority to enter and inspect the Premises at all reasonable times and in any reasonable manner;

RATES AND CHARGES

2.9 pay all rates, taxes, charges and other statutory outgoings, which become payable on or in respect of the Land, as they fall due;

CLEAN AND TIDY

2.10 at all times, keep the Premises clean, tidy and free from rubbish and other unsightly or offensive matter PROVIDED ALWAYS THAT should the Lessee fail to do so the Authority may, at the cost of the Lessee, cause any matter or thing to be removed from the Premises and restore the Premises to a clean and tidy condition.

3. MUTUAL OBLIGATIONS

The parties agree that:

OWNERSHIP OF MINERALS AND WATER

3.1 all minerals on or in the Land and the right to the use, flow and control of ground water under the surface of the Land are reserved to the Territory;

FAILURE TO REPAIR AND MAINTAIN

3.2 if the Lessee fails to repair and maintain the Premises in accordance with subclause 2.7, the Authority may, by written notice to the Lessee, require the Lessee to carry out the repairs and maintenance within a specified period of not less than one month;

3.3 if the Authority believes that any Building is beyond repair, the Authority may, by written notice to the Lessee, require the Lessee to:

(a) remove the Building; and

(b) construct a new Building to a standard acceptable to the Authority according to approved plans;

within a specified period of not less than one month;

3.4 if the Lessee fails to comply with a notice given under subclause 3.2 or 3.3, the Authority may enter the Premises, with anyone else and with any necessary equipment, and carry out the work which the Lessee should have carried out. The Lessee must pay to the Authority, on demand, the costs and expenses of that work;

TERMINATION

3.5 if:

(a) the Lessee at any time does not use the Land for a period of one year for the Purpose; or

(b) the Lessee fails to do any of the things which the Lessee has agreed to do in this Lease and that failure continues for three months (or such longer period as may be specified by the Authority) after the date of service on the Lessee of a written notice from the Authority specifying the nature of the failure;

THEN the Authority on behalf of the Commonwealth may terminate the Lease by giving a written notice of termination to the Lessee. That termination will not adversely affect any other right or remedy which the Authority or the Commonwealth may have against the Lessee for the Lessee's failure;

3.6 the power of the Authority on behalf of the Commonwealth to terminate the Lease under subclause 3.5 shall not be affected by:

(a) the acceptance of rent or other money by the Authority during or after the notice has been given; or

(b) any delay in exercising any right, power or remedy under the Lease;

FURTHER LEASE

3.7 the Lessee will be entitled to a further Lease of the Land on such terms as the Act provides;

NOTICES

3.8 any written communication to the Lessee is given if signed on behalf of the Authority and delivered to or sent in a prepaid letter addressed to the Lessee at the Land or at the last-known address of the Lessee or affixed in a conspicuous position on the Premises;

EXERCISE OF POWERS

3.9 Any and every right, power or remedy conferred on the Commonwealth or Territory in this Lease, by law or implied by law may be exercised on behalf of the Commonwealth or the Territory or as the case may be by:

(a) the Authority;

(b) an authority or person for the time being authorised by the Authority or by law to exercise those powers or functions of the Commonwealth or Territory; or

(c) an authority or person to whom the Authority has delegated all its powers or functions under the Planning and Development Act 2007.

.....

Signed by **JIM CORRIGAN**)
a delegate authorised to execute this)
Memorandum of Provisions on behalf)
of the Commonwealth)

ANNEXURE C - SPECIAL CONDITIONS

48 FRONT LANDSCAPING

48.1 Notwithstanding clause 11 the Buyer acknowledges that it is solely responsible for providing the Font Landscaping to the Land.

48.2 This Contract is amended as follows:

(a) in clause 5.1 inserting "special condition 48.1"after "11" ; and

(b) in clause 46.1 amending the definition of "Front Landscaping" by deleting the words " Seller providing".

For clarity, the Buyer acknowledges that the purpose of these amendments is to require the undertaking of the Front Landscaping as an obligation which is secured by the Compliance Bond.

49 LEASE BACK

49.1 The Buyer has agreed to give Riverview Projects (ACT) Pty Ltd (Riverview) the benefit of exclusive possession of the Property following Completion.

(a) Riverview must pay rent of [(5% of the purchase price) + GST payable monthly in arrears and subject to receipt of an invoice] to the Buyer as an allowance in favour of the Buyer on Completion. Rent is payable monthly in arrears and subject to receipt of an invoice.

(b) The Buyer acknowledges that;

(i) vacant possession will not be provided on Completion.

(ii) possession of the Property is granted to Riverview until 30 June 2023 for use for the Ginninderry display village (including the ability to rent out part of the Land for accommodation purposes) with an option at the sole option of Riverview to extend the term by up to 6 months;

(iii) payment for all rates, taxes and outgoings (including electricity and water consumption) in respect of the Property is the responsibility of the Buyer following Completion of this Contract.

(c) Riverview must on expiry of the lease back ensure that the Property is left in a clean and tidy condition.

ANNEXURE D - HOUSING DEVELOPMENT REQUIREMENTS

Design Requirements for Blocks 1, 2 and 3 Section 15

Strathnairn

Version 1.0 | October 2022

Ginninderry

Contents

Contents

Part 1: Introduction

The Ginninderry vision: an inspiring 21st century community

The Ginninderry community will be unique in our region. It extends across the ACT/NSW border to the west of Belconnen and is being developed by a Joint Venture between the ACT Suburban Land Agency (SLA) and Riverview Developments (ACT) Pty Ltd.

From the start, our vision for Ginninderry has been to build a community of international significance, with innovation, diversity and ecological criteria at its core. Now we're bringing this vision to life.

Setting the highest standards

This Integrated Development Parcel at Ginninderry will form part of a whole neighbourhood design.

The project team has established high expectations for Ginninderry, perhaps best illustrated by the project's accreditation as Canberra's first 6 Star Green Star Community, through the Green Building Council of Australia. To achieve this certification, we've shown that Ginninderry will be a worldleading community, exhibiting international best practice in urban design and development.

All residents at Ginninderry will benefit from a vast conservation corridor, well connected pedestrian and cycling pathways, tree lined streets and easy access to public transport.

Ginninderry aspires to be recognised as a world leader in sustainable development, delivering a community that is:

- better planned and designed
- more dynamic and vibrant
- a healthy place to live work and play
- productive and prosperous
- flexible, adaptable and resilient.

Innovative ideas and technologies

Like all communities, Ginninderry will evolve and change over time, and so too will building design technologies and materials. It is quite possible that innovative energy, comfort and cost outcomes may be achieved by using new technologies, practices and principles not contemplated in this document.

At the discretion of the Development Manager, mandatory requirements may be varied if better alternatives and solutions are proposed, that do not compromise the overall integrity of Ginninderry's design philosophy.

Part 2: Design Approval Process

Integrated Development Parcel designs at Ginninderry need to comply with the following:

- These Design Requirements
- Plans relating to this block in Part 4 Appendices
- Relevant rules in the Single Residential Dwelling Housing Development Code of the Territory Plan
- Strathnairn Precinct Map and Code

Compliance Bond

An important part of the Contract for Sale of land at Ginninderry is the requirement for the payment of a Compliance Bond at the time of settlement. The Compliance Bond is to ensure the adherence to these Design Requirements.

Minimum Requirements

The conditions for the return of the Compliance Bond are:

- The design(s) has been submitted to and approved by the Development Manager prior to building commencement.
- The Integrated Development Parcel homes have been built to the approved design in accordance with the Design Requirements
- A letter/quote from your solar installer certifying that the PV system with inverter and Home Energy Management System has been installed to comply with the Design Requirements
- Any damage caused by the construction of the dwellings to the surrounding verges, street trees, footpath, services and adjoining land has been rectified to the satisfaction of Transport Canberra and City Services (TCCS) and our Development Manager
- All waste on the public verge and adjoining land has been removed
- The purchaser (builder) may not seek to transfer the compliance bond requirements to the ultimate owner of the dwelling(s)
- If your home is found to be compliant, your full Compliance Bond will be returned.

Part 3: Design Requirements

The following information outlines the Design Requirements for Blocks 1-3 Section 15 within Strathnairn.

Design Principle	Design Requirements
Public Domain Interface Provide legible and attractive interfaces that achieve passive surveillance to public streets and lane-ways.	Front doors of each dwelling are clearly visible from a public street or lane-way and include a covered entry feature or portico. Windows fronting a public road from habitable rooms, balconies or decks overlook the public domain. Courtyard walls are to be provided to comply with the Precinct Code and are required to be coordinated with all service requirements, including clearance to any water meters and free access to any electrical meter boxes. Where development frontages are adjacent to open spaces, parks, public walkways or located on a corner, the following requirements apply: • Habitable rooms have windows to provide passive surveillance (i.e. no 'blank' facades) • Building entries and pathways are visible and legible from public domain.

Surveillance of Public Domain

Clear entries behind courtyard walls

Design Principle	Design Requirements
Local Character and Context The built form, articulation and scale relates to the local character of the area and its context.	The design should sit comfortably with the Strathnairn Master plan. Blocks 1-3 Section 15 is a part of an existing urban framework. The blocks are bound by a primary street frontage Bonthrone Street and a rear lane network Ferrari Court. The Integrated Development Parcel is rear loaded for vehicular access from Ferrari Court. Blocks 7-10 Section 16 to the East are 2 storey townhouse style dwellings. Blocks 1-5 Section 16 to the West are standard single residential blocks with individual dwellings located. Block 6 Section 16 is an MU4 site located immediately to the North of Ferrari Court.
Landscape Design The landscape design requires healthy plant and tree growth space for medium sized trees.	Primary frontages require 1 medium tree with mature height of 5m if primary setback is 3m or greater. Rear or Internal courtyards must include 1 tree with mature height of 5-8m. The landscape plan proposes a combination of tree planting, for shade, mid height shrubs, lawn and ground covers. Include a mix of species that are appropriate for scale and shading. Synthetic or artificial grass is not permitted The verge areas between the front boundary of the Land and the kerb must be turfed. Refer Appendix B for suggested Landscape Planting Palette.

Courtyard spaces should allow natural light and cross-ventilation to living spaces

An example of a vertical greenwall to help soften small courtyard areas

Design Principle	Design Requirements
Visual Appearance and Façade Articulation To promote well designed buildings of high Architectural quality that contribute to the local character. The facades of the integrated development parcel homes must be designed as an integrated pack to provide an consistent streetscape.	The development is to incorporate articulation to frontages. The following elements help provide functional articulation. The design must demonstrate how it responds to the following elements: • Covered entry feature or portico is mandatory • A balcony, deck, pergola, terrace, or veranda • Extruded box window treatments • Awnings, sunhood, and louvres • Eaves • Access ramps as required The overall streetscape must have a light base colour as the prominent wall finish with light weight cladding and include a mix of materials to provide articulation. Double storey designs must incorporate balconies at bookends/ corners with a combination of solid and perforated metal or glass balustrades. Facade glazing to street frontages must be more vertical in proportion with mullion spacing less than 1.0m. Openings of 2.4m wide or more must be a minimum of 3 panels. Metal profile cladding systems or FC style boards with profile widths of a maximum 200mm are encouraged.

Sunhood and Awning

Light filled screened balconies.

Clearly articulated facades add value and character to the streetscape

Passive Surveillance with articulated and screened balconies

Clearly articulated facades add value and character to the streetscape

Design Principle	Design Requirements
Visual Appearance and Articulation to Corners	Refer to the block planning controls. Corner blocks are required to provide a minimum of 50% articulation to the secondary frontage. Articulation elements such as balconies, blade walls, pergolas, sunhoods, awnings, façade treatments, material use and expressed structure are required to add visual interest and avoid large blank wall planes to prominent corners. Buildings may need to be stepped back further on corners to permit balconies, glazing and larger eaves without encroachment into secondary front setbacks. All materials must wrap around the corner of the dwellings by at least 4 metres. The blocks identified below must provide articulation elements as set out above. Refer to the Block Planning Controls drawings which identifies the locations. Block 1 Section 15 to Ferrari Court and Bonthrone Street Block 3 Section 15 to Bonthrone Street and Ferrari Court
Roof Form	The roof treatments are integrated into the building design and positively respond to the street and laneway and provide for individual expression for each dwelling. The roof form must consider how to integrate the solar panels. Lights and ventilation systems are integrated into the roof design. • Gable roof – minimum 25 degrees Skillion – 10 to 15 degrees minimum • Carports and garages to laneways 5-10 degrees • Parapets must be constructed in such a way that they project past the roofline to conceal all gutters. • Integrated roof forms concealing multiple dwellings are not permitted. • Standard Colourbond roof profiles are permitted Roof solar absorption of <0.7 preferred (typically light or medium colours). • Very dark/black roofs and very light, highly reflective roofs are not permitted • Others roof forms may be considered on architectural merit.
Roofing Materials	Metal profile roof sheeting only. Refer to Approved Colours and Finishes palette part 4
Eaves, Awnings and Sunhoods	Minimum 450mm eaves required. Any windows that are not protected by an eave , i.e. parapet walls, require awnings or sunhoods, except south facing windows.
Bush Fire Requirements	There are no bush fire requirements within Strathnairn

Design Principle	Design Requirements
Energy Efficiency Rating	A minimum NatHERS rating of 7.0 is required for each dwelling.
Zoning	RZ3
Building Height	Up to 2 storeys permitted
Building Front Setback	Minimum 4m – to Bonthrone street
Fencing & Courtyard Walls	Refer to Strathnairn Precinct Map and Code, Single Dwelling Housing Development Code and Block Planning Control Plans. **Mandatory** – refer to Fencing Controls Plan, Strathnairn Precinct Map and Code and Single Dwelling Housing Development Code and Block Planning Control Plans.
PPOS Requirements	Refer to Strathnairn Precinct Map and Code, Single Dwelling/ Multi Unit Housing Development Code (as applicable) and Block Planning Control Plans.
Natural Ventilation	All habitable rooms must be naturally ventilated.
Garage and Garage Doors	Garages are to be located where zero boundary are permitted via the Strathnairn Precinct Code Provision, refer to the Block Planning Control Plan. Consider the use of masonry base elements to corners of garages and lightweight elements where appropriate. We may consider alternate articulation of rear laneways on architectural merit such as where surveillance units are adopted or unusual lot shapes require an alternate design response. Additional setbacks to a laneway may be required to accommodate services such as sewer, water and storm water ties and any other associated service. Provide panel lift or tilt up garage doors. Roller doors are not permitted.

Garage storage solutions

Bicycle storage solutions

Laundry linen storage

Design Principle	Design Requirements
Bin Locations	Bin locations should be integrated with the dwelling designs and screened from public view. Kitchen design must allow for easy waste separation (including general waste, recycling and green waste) must be provided.
Ceiling Heights	Ceiling heights are to achieve sufficient natural ventilation and provide daylight access and spatial quality. Minimum ceiling heights: • 2.7m to ground floor habitable rooms • 2.7m to upper floor living areas • 2.5m to upper level bedrooms
Glazing	uPVC or thermally broken aluminum double glazing is required to all external windows and doors.
Home Energy Management System	Main gas connections are not provided to residential blocks in Ginnninderry. Dwellings must be all-electric with no mains or bottled gas connections. A PV System with a Home Energy Management System and compatible inverter must be installed for all dwellings under the following provisions: a. Minimum PV size: • 1-2 Bedroom = 3 (mandatory minimum PV size(kW)) • 3+ Bedroom = 4 (mandatory minimum PV size(kW)) b. Home Energy Management System must be a Reposit Power (battery is required) or Evergen. c. The solar inverter must be compatible with the chosen Home Energy Management System above. d. Where PV panels are located on a roof section fronting a street, they must be installed flush with the roof. e. All hardware components must be installed by a certified Clean Energy Council Installer.
Appliances and Fixtures	Induction cooktops must be provided to all dwellings. All appliances, water fixtures and fittings must have a minimum 4 star rating under the water efficiency labeling and standards (WELS) scheme and (where required) a 4 star energy rating under the energy rating label (Energy Efficiency Rating) scheme. This includes showerheads, tap ware, toilets, fridges, freezers, washing machines, dryers and any other appliance provided with the dwelling

Design Principle	Design Requirements
Hot Water Systems	All dwellings must have a solar or heat pump hot water system installed. Roof top solar water collectors are not permitted on the roof fronting the street. Consideration must be given to the location of any tank including screening or placement within a cupboard or garage space. Hot water systems must be climate appropriate and have temperature application range down to -5 degrees ambient air temperature.
Heating and Cooling	Passive heating and cooling must be considered for all dwellings including ceiling fans and thermal mass) If Mechanical heating and/ or cooling systems are installed they must be: a. reverse cycle air conditioning with: • Energy Efficiency Rating of 3 or higher for cooling cycle • Coefficient of Performance of 3.5 or higher for heating cycle • Outdoor unit with sound pressure level of 57dBA or lower for heating and cooling cycle b. air conditioning with a cooling cycle only that achieves an Energy Efficiency Rating of 3 or higher c. ducted evaporative cooling with self-closing damper d. ground source heat pump. Considerations must be given to the location of any outdoor fan coil unit including screening and compliance with ACT EPA noise requirements.
Rainwater Tanks	Rainwater Tanks should be considered for all dwellings The following minimum size requires applies: • Block 1 Section 15: 4,000 litres • Block 2 Section 15: 2,000 litres • Block 3 Section 15: 2,000 litres

Narrow style rainwatrer tanks can be used where space requirements are restrictive

Rainwater tanks incorporated into a carport design shows clever and effective use of small spaces

Design Principle	Design Requirements
Retaining Walls Extensive earthworks should be limited where possible to minimise the extent of retaining wall costs and the visual impacts to the streetscape.	**Minimum Requirements** • The height of site cuts along the side boundaries with attached neighbouring wall cannot exceed 500mm in height • Retaining wall forward of the front building line must be constructed from the following materials at the discretion of the Ginninderry Development Manager - Approved face brick - Approved rendered masonry - Approved brickwork such as split face, honed or shot blast finishes - Approved stone faced masonry - Approved reinforced concrete finishes • Timber, concrete sleepers or prefabricated modular systems are not permitted forward of the building line. • Retaining walls alongside boundaries forward of the building line must be tapered or stepped in line with the finished ground level at the front boundary. • Where there are services such as water, electrical, communications, sewer and storm water, detailed coordination of all courtyard wall locations and associated services must be considered in the initial design process.
Rear Lane Access	Blocks 1-3 Section 15 are rear loaded blocks. Access is via flush kerb from Ferrari Court to all blocks. **Minimum Requirements** • Driveways must be constructed from either - plain concrete or - maximum 5% Oxide finish

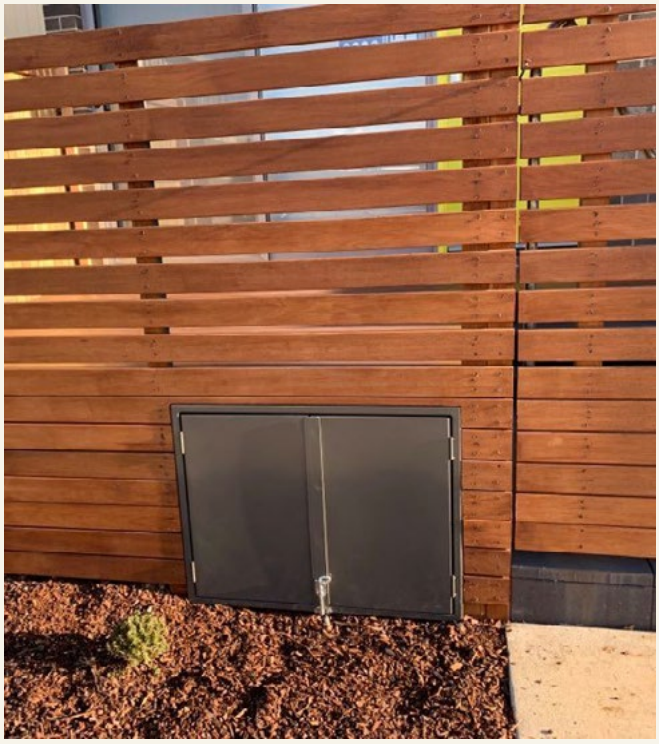
Arch split face block

Streetscape

Well articulated dwelling designs provide a functional and more attractive streetscape

Design Principle	Design Requirements
Services and ancillary structures	Services such as water, electricity meter boxes, NBN and home energy system cabinets can have an adverse impact on the overall streetscape if not considered as part of the overall design. The location of the above services will be required to be shown on the site plan as part of the design approval process. **Minimum Requirements:** • Water, electricity meter boxes, NBN and home energy system cabinets must be integrated into the front façade and located away from the front door • Solar panels must sit flush with the roof line if located to the street frontages of the dwellings • Storage tank for solar HWS is not permitted to be mounted on the roof fronting the street • Aerials, satellite dishes, antennae, heat pumps, A/C units and evaporative units are to be located to the rear of the dwellings and must not be visible from the street. • Clothes drying lines and garbage bins are to be located to the rear of the terraces. If they are located to the side of the house within the Primary Building zone, they must be screened from public view. • Sheds, outdoor structures are to be located to the rear of the terraces and away from public view.
Dog and Cat containment	Minimum Requirements: Suburbs within Ginninderry are Cat Containment and Dog on Leash areas. Terrace designs should give consideration to responsible pet ownership principles including the use of enclosures or cat runs. More information can be obtained at: https://www.cityservices.act.gov.au/pets-and-wildlife/domestic-animals/cats/cat-containment • Dogs must remain on leash in public areas except within designated un-leashed areas such as dog parks. • Dogs are not permitted in the conservation corridor.

Cat containment



Integrated water meter details within courtyard walls

Site location map

Part 4: Appendix

External Colours and Finishes Schedule

Please tick the boxes below

Roof Tiles – Monier

Atura	☐ Mist Grey	☐ Saltspray	☐ Seashell	☐ Wildrice
Horizon	☐ Mist Grey	☐ Saltspray	☐ Seashell	☐ Wildrice

Roof Tiles – Boral

Vogue	☐ Stonewall
Contour	☐ Quartz
Slimline	☐ Stonewall

Roof Tiles – Bristile

Prestige	☐ Silver Gum				
Classic	☐ Alabaster	☐ Linen	☐ Silver Gum

Metal Roof – Colorbond

☐ Basalt	☐ Cove	☐ Dune	☐ Evening Haze	☐ Gully	☐ Windspray
☐ Jasper	☐ Shale Grey	☐ Surfmist	☐ Wallaby	☐ Paperbark	

Fence Colour - Colorbond

Side and Rear Boundary Fencing

☐ Jasper

Fence Infill Panel / Street Facing Fencing - Colorbond

☐ Basalt	☐ Cove	☐ Dune	☐ Evening Haze	☐ Gully	☐ Windspray
☐ Jasper	☐ Natural Pearl	☐ Shale Grey	☐ Surfmist	☐ Wallaby	☐ Ultra Silver
☐ Precious Silver	☐ Silver Medalist				

Garage Doors

☐ Basalt	☐ Cove	☐ Dune	☐ Evening Haze	☐ Gully	☐ Windspray
☐ Jasper	☐ Natural Pearl	☐ Shale Grey	☐ Surfmist	☐ Wallaby	☐ Ultra Silver
☐ Precious Silver	☐ Silver Medalist	☐ Blushed Teak	☐ Classic Cedar	☐ Iron Bark	☐ Kwila
☐ Merbau	☐ Silky Oak	☐ Weathered Timber	☐ Western Red Cedar		

Façade Colours Walls / Render / Cladding

☐ Basalt	☐ Cove	☐ Dune	☐ Evening Haze	☐ Gully	☐ Windspray
☐ Jasper	☐ Natural Pearl	☐ Shale Grey	☐ Surfmist	☐ Wallaby	☐ Ultra Silver
☐ Precious Silver	☐ Silver Medalist	☐ Beige Royal	☐ Braid	☐ Cru	☐ Lexicon
☐ Light Rice	☐ Linseed	☐ Natural White	☐ Oyster Linen	☐ Terrace White	☐ Toffee Fingers
☐ Tuft	☐ Warm Neutral				

Bricks – Austral

La Paloma	☐ Miro			
Urban One	☐ Silver	☐ Chiffon	☐ Pepper	
Wilderness Design	☐ Silver Birch	☐ Blue Gum	☐ Blackbutt	
Everyday Life	☐ Engage	☐ Freedom	☐ Leisure	
Whitsunday Range	☐ Brampton	☐ Orpheus		
San Selmo Smoked	☐ Grey Cashmere (F.O.)	☐ Cloudy Silver (F.O.)	☐ Opaque Slate (F.O.)	☐ Wild Storm (F.O.)
Metallix	☐ Quartz	☐ Platinum	☐ Titanium	☐ Cuprum
	☐ Bronze	☐ Gun Metal Blue		
Park Lane	☐ Biltmore	☐ Grosvenor	☐ Dorchester	☐ Mayfair
	☐ Westminster	☐ Chesterfield (F.O.)		
Stratos	☐ Winter Frost	☐ Coastal Storm		
Bowral Highlands	☐ Meryla (F.O.)	☐ Penrose (F.O.)	☐ Wingello (F.O.)	☐ Jellore
	☐ Tarlo			

F.O. Feature area only

Bricks – PGH

Alfresco	Vino	Chocolatto	Truffle	Espresso
	Urban Blue			
Altitude	Olympus	Apollo	Matterhorn	
Dry Pressed Architectural	Bennelong Blue	Bradfield Bronze	Flinders Red	Gledswood Blend
	Macquarie Blend	Tinto Cream	Mawson White	Silver Shadow
	McKinlay Brown	Monash Grey		
Dark and Stormy	Monsoon	Thunder	Whirlwind	Zephyr
Foundations	Gravel	Stone		
Highlands	Blackheath	Leura (F.O.)		
Manhattan	Chelsea (F.O.)	East Hampton (F.O.)	Tribeca (F.O.)	
Metallic	Nickel Flash	Pewter	Blue Steel Flash	
Morada	Blanco	Ceniza	Nero (F.O.)	Gris
Opaline	Tourmaline	Garnet	Tiger Eye	
Pure Linens	Cinders & Soot	Flannel Grey	Pebble Creek	Whispering White
Smooth	Mineral	Volcanic	Cream	Pearl Grey
	Brown	Terracota	Choc Tan	Copper Glow
	Black & Tan			
Urban Essence	Melbourne Blue (F.O.)	Storm (F.O.)		
Velour	Terracota	Cream	Pearl Grey	Red
	Brown	Choc Tan	Mineral	Volcanic

F.O. Feature area only

Appendix B

Landscape Concept Planting Palette

Edible Plants

Below is a list of edible plants that Ginninderry encourages you to plant when landscaping your garden.

Code	Botanical Name	Common Name	Mature Plant Size	Container Size	Spacing
Small Trees					
Mad	Malus domestica	Apple	3m x 3m	100L	-
Pyc	Prunus cerasifera	Cherry Plum	5m x 5m	100L	-
PrpA	Prunus persica 'Anzac'	Australian Peach	4m x 4m	100L	-
PrsAB	Prunus salicina 'Angelina Burdett'	Plum	4-10m x 2-4m	100L	-
Large Shrubs					
Cil	Citrus limon 'Meyer'	Meyer Lemon	3m x 2m	25L/300mm	1.5/m²
Fes	Feijoa sellowiana	Pineapple Guava	4m x 2m	25L/300mm	1.5/m²
Mia	Microcitrus australasica	Finger Lime	4m x 2m	25L/300mm	1.5/m²
Small Shrubs					
Roo	Rosemarinus officinalis	Rosemary	0.5-1.5m x 1m	5L/200mm	3/m²
Vac	Vaccinium corymbosum	Blueberry - Blue Rose	1-2m x 1-2m	5L/200mm	3/m²
Cij	Citrus japonica	Kumquat	2-3m x 3m	5L/200mm	3/m²
Groundcovers/ Climbers					
Fra	Fragaria ananassa	Strawberry	0.3m H	2.5L/150mm	4/m²

Small Trees

Malus domestica

Malus domestica – fruit

Prunus cerasifera

Prunus persica

Prunus salicina - fruit

Large Shrubs

Citrus limon

Feijoa sellowiana

Microcitrus australasica

Groundcovers

Fragaria ananassa

Small Shrubs

Rosemarinus officinalis

Vaccinium corymbosum

Citrus japonica

Ginninderry

Landscape Concept Planting Palette

Native Plants

Below is a list of native plants that Ginninderry encourages you to plant when landscaping your garden.

Code	Botanical Name	Common Name	Mature Plant Size	Container Size	Spacing
Large Shrubs (Hedging)					
BNm	Banksia marginata	Silver Banksia	5m x 3m	25L/300mm	1.5/m²
BNsp	Banksia spinulosa	Hairpin Banksia	3m x 3m	25L/300mm	1.5/m²
Cbf	Callistemon 'Great Balls of Fire'	Bottlebrush	2m x 2m	25L/300mm	1.5/m²
Ckp	Callistemon 'King's Park Special'	Bottlebrush	2-4m x 3-4m	25L/300mm	1.5/m²
Cra	Callistemon viminalis 'Red Alert'	Creek Bottlebrush	4m x 2m	25L/300mm	1.5/m²
Gpp	Grevillea 'Poorinda Peter'	Poorinda Peter Grevillea	3m x 4m	25L/300mm	1.5/m²
Gpq	Grevillea 'Poorinda Queen'	Poorinda Queen Grevillea	3m x 4m	25L/300mm	1.5/m²
Gho	Grevillea 'Red Hooks'	Red Hooks Grevillea	3m x 4m	25L/300mm	1.5/m²
Small Shrubs					
Anf	Anigozanthus 'Bush Gem'	Kangaroo Paw	0.6m x 1m	5L/200mm	3/m²
BKl	Baeckea linifolia	Flax-leaf Heath Myrtle	1-2.5m x 0.5-2m	5L/200mm	3/m²
Gco	Grevillea confertifolia	Dense-leaf Grevillea	2m x 1-2m	5L/200mm	3/m²
Gla	Grevillea lanigera	Wooly Grevillea	0.5-1m x 1-2m	5L/200mm	3/m²
Wab	Westingia sp. 'Aussie Box'	Coast Rosemary	1.5m x 1.5m	5L/200mm	3/m²
Small Shrubs (Hedging to Frontage)					
Cvc	Callistemon viminalis 'Captain Cook'	Bottlebrush		5L/200mm	3/m²
Etm	Philotheca myoporoides	Long-leaf Waxflower	1.5-2m x 2m	5L/200mm	3/m²
Gba	Grevillea baueri	Bauer's Grevillea	0.6-1.5m x 2m	5L/200mm	3/m²
Wew	Westingia fruticosa 'Grey Box'	Coastal Rosemary	2m x 4m	5L/200mm	3/m²
Groundcover/Climbers					
Acc	Acacia cognata 'limelight'	Dwarf River Wattle	0.5m x 1m	2.5L/150mm	4/m²
Asfp	Astartea fascicularis	Winter Pink	0.3m x 1.5m	2.5L/150mm	4/m²
BNsp	Banksi spinulosa 'Birthday Candle'	Birthday Candle Banksia	0.5m x 1.5m	2.5L/150mm	4/m²
BRm	Brachyscome multifida	Rock Daisy	0.3m x 1.5m	2.5L/150mm	4/m²
Coc	Convolvulus cneorum	Bush Morning Glory	0.6m x 1m	2.5L/150mm	4/m²
Gbr	Grevillea sp. 'Bronze Rambler'	Bronze Rambler Grevillea	0.3m x 2m	2.5L/150mm	4/m²

Hav	Hardenbergia violacea	Purple Coral Pea	3m x 1m	2.5L/150mm	4/m²
Myp	Myoporum parvifolium	Creeping Boobialla	0.2m x 2m	2.5L/150mm	4/m²
RHs	Rhagodia spinescens 'Aussie Flat Bush'	Aussie Flat Bush	0.3-0.5m x 1m	2.5L/150mm	4/m²
Vih	Viola hederacea	Australian Native Violet	0.1m x 0.5m	2.5L/150mm	4/m²
Grasses					
Dlc					
Dic	Dianella caerulea 'Cassa Blue'	Cassa Blue Flax Lily	0.7m x 1m	Growtube	6/m²
Dll	Dianella longifolia	Pale Flax Lily	0.6m x 0.4m	Growtube	6/m²
Dlr	Dianella revoluta	Black Anther Flax Lily	0.5m x 0.5m	Growtube	6/m²
Dlt	Dianella tasmanica	Blue Flax Lily	0.7m x 1m	Growtube	6/m²
LDlC	Lomandra longifolia 'Cassica'	Cassica Mat Rush	1.2m x 0.8m	Growtube	6/m²
LDlT	Lomandra longifolia 'Tanika'	Tanika Mat Rush	0.5m x 0.5m	Growtube	6/m²
POAlE	Poa labillardieri	Tussock Grass	0.6m x 0.4m	Growtube	6/m²
THt	Themeda triandra	Kangaroo Grass	1m x 0.5m	Growtube	6/m²

Large Shrubs (Hedging)

Banksia marginata

Banksia spinulosa

Callistemon 'Balls of Fire'

Callistemon 'Kings Park'

Callistemon 'Red Alert'

Grevillea 'Poorinda Peter'

Grevillea 'Poorinda Queen'

Grevillea 'Red Hooks'

Small Shrubs

Angiozanthus 'Bush Gem'

Baeckea linifolia

Grevillea confertifolia

Grevillea lanigerav

Small Shrubs (Hedging to Frontage)

Callistemon viminalis

Philotheca myoproides

Grevillea baueri

Westringia 'Grey Box'

Groundcover/Climbers

Acacia cognata 'Limelight'

Astartea fascicularis

Banksia 'Birthday Candles'

Brachyscome multifida

Convolvulus cneorum

Grevillea 'Bronze Rambler'

Hardenbergia violacea

Myoporum parvifolium

Rhagodia spinescens

Viola hederacea

Grasses

Camellia sasanqua

Cupressus sp.

Michelia figo

Thuja sp.

Viburnum tinus

Lomandra 'Tanika'

Poa labillardieri

Themeda triandra

Ginninderry

Landscape Concept Planting Palette

Exotic Plants

Below is a list of exotic plants that Ginninderry encourages you to plant when landscaping your garden.

Code	Botanical Name	Common Name	Mature Plant Size	Container Size	Spacing
Small trees/Large Shrubs					
Acb	Acer buergeranum	Trident Maple	5m x 3m	100L	
Acj	Acer japonicum	Japanese Maple	5m x 5m	100L	
Cil	Citrus x Lemon	Lemon	-	25L/300mm	1.5/m2
Cra	Cordyline Australis	Cabbage Tree	2m x 1.5m	5L/200mm	3/m²
CNc	Cornus capitata	Evergreen Dogwood	3m x3m	25L/300mm	1.5/m²
Dyk	Diospyros kaki	Japanese Persimmon	6-8m x 6m	100L	-
Dia	Dicksonia antarctica	Soft Tree Fern	2-4m x 2.5m	25L/300mm	-
Kop	Koelreuteria paniculata	Golden Rain Tree	5m x 8m	100L	-
Lai	Lagerstroemia indica	Crepe Myrtle	3m x 2m	25L/300mm	-
MGl	Magnolia grandiflora 'Little Gem'	-	6m x 3m	100L	-
Mgso	Magnolia soulangeana	Saucer Magnolia	4m (h)	100L	-
Mgst	Magnolia stellata	Star Magnolia	4-6m x 4.5m	100L	-
Pcp	Prunus cerasifera 'Pissardii'	Cherry Plum	5m x 5m	100L	-
Pcs	Prunus cerasifera 'Spire'	Black Cherry Plum	6m x 2m	100L	-
Pyc	Pyrus calleryana	Ornamental Pear	11m x 4m	100L	-
Large Shrubs (Hedging)					
CAMs	Camellia sasanqua	Sasanqua Camellia	4m x 3m	25L/300mm	1.5/m²
Cup	Cupressus sp.	Cypress Sp.	-	25L/300mm	-
Eiv	Escallonia sp. 'Iveyi'	Escallonia	3m x 3m	25L/300mm	1.5/m²
MIf	Michelia figo	Port Wine Magnolia	2m x 2m	25L/300mm	1.5/m²
Pitt	Pittosporum tenuifolium 'Green Pillar'	Pittosporum	3m x 2m	25L/300mm	1.5/m2
Pla	Prunus lauocerasus	Cherry Laurel	5m x 3m	25L/300mm	-
Plu	Prunus lusitanica	Portugese Laurel	4m x 2m	25L/300mm	-
THj	Thuja Sp.	Cedar Sp.	-	25L/300mm	-
VIO	Viburnum odoratissimum	Sweet Viburnum	4-6m x 4m	25L/300mm	1.5/m²
VIT	Viburnum tinus	Lauristinus	3m x 3m	25L/300mm	1.5/m²

Small Shrubs					
Azs	Azalea sp.	Azalea		5L/200mm - 25L/300mm	3/m²
Bey	Beschorneria yuccoides	Mexican Lily	1-1.5m x 1-2m	25L/300mm	-
Epp	Escallonia sp. 'Pink Pixie'	Escallonia	0.8m x 0.8m	5L/200mm	3/m²
LVA	Lavandula angustifolia	White English Lavender	0.3m x 0.3m	5L/200mm	3/m²
LOn	Lonicera nitida	Dwarf Honeysuckle	2m x 3m	25L/300mm	1.5/m²
NNn	Nandina domestica 'Nana'	Dwarf Screen Bamboo	0.3m x 2m	5L/200mm	3/m²
Small Shrubs (Hedging to Frontage)					
ABg	Abelia grandiflora	Glossy Abelia	1.5m x 1.2m	5L/200mm	3/m²
BUs	Buxus sempervirens	English Box	2m x 1m	5L/200mm	3/m²
CYt	Choisya ternata	Mexican Orange Blossom	1.5m x 1.5m	25L/300mm	1.5/m²
Erk	Escallonia sp. 'Red Knight'	Escallonia	1.5m x 1.5m	25L/300mm	1.5/m²
GAf	Gardenia augusta 'Florida'	Gardenia Florida	1-1.5m x 1m	5L/200mm	3/m²
Groundcovers/Climbers					
AJr	Ajuga reptans	Common Bugle	0.1m x 0.3m	2.5L/150mm	4/m²
COPk	Coprosma x kirkii	Mirror Plant	0.6m x 1m	2.5L/150mm	4/m²
HEc	Hedera canariensis (green form only)	Canary Island Ivy	n/a	2.5L/150mm	4/m²
HYc	Hypericum calycinum	Aaron's Beard	0.3m x 0.5m	2.5L/150mm	4/m²
RSl	Rosmarinus lavandulaceus	Creeping Rosemary	0.3m x 0.3m	2.5L/150mm	4/m²
TRj	Trachelospermum jasminoides	Chinese Star Jasmine	n/a	2.5L/150mm	4/m²
VIa	Vitis amurensis	Ornamental Grape Vine	n/a	2.5L/150mm	-
Grasses					
LIEg	Liriope 'Evergreen Giant'	Evergreen Giant Lily	0.4m x 0.7m	Growtube	6/m²
Opn	Ophiopogon planiscapus 'Nigrescens'	Black Mondo Grass	0.2m x 0.8m	Growtube	6/m2

Grasses

Liriope 'Evergreen Giant'

Ophiopogon 'Nigrescens'

Small Trees/ Large Shrubs

Acer buergeranum

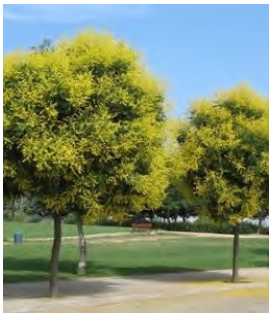
Acer japonicum

Citrus x limon

Cordyline australis

Cornus capitata

Diospyros kaki



Koelreuteria paniculata

Lagerstroemia indica

Magnolia grandiflora

Magnolia soulangeana

Magnolia stellata

Prunus cerasifera ‘Pissardii’

Prunus cerasifera ‘Spire’

Ptrus calleryana

Large Shrubs (Hedging)

Camellia sasanqua

Cupressus sp.

Michelia figo

Thuja sp.

Viburnum tinus

Small Shrubs

Camellia sasanqua

Cupressus sp.

Michelia figo

Thuja sp.

Viburnum tinus

Small Shrubs (Hedging to Frontage)

Abelia grandiflora

Buxus sempervirens

Choisya ternata

Gardenia augusta

Groundcover/Climbers

Ajuga repens

Coprosma x 'Kirkii'

Hedera canariensis

Hypericum calycinum

Rosmarinus lavandulaceus

Trachelospermum sp.

Vitis amurensis

Ginninderry

Pest Plant List

Not for use at Ginninderry

Botanical Name	Common Name	Reason
Ailanthus altissima	Tree of Heaven	Declared pest plant of the ACT
Alnus glutinosa	Black Alder	Declared pest plant of the ACT
Alternanthera philoxeroides	Alligator Weed	Declared pest plant of the ACT
Andropogon gayanus	Gamba Grass	Declared pest plant of the ACT
Annona glabra	Pond Apple	Declared pest plant of the ACT
Anredera cordifolia	Madeira Vine	Declared pest plant of the ACT
Asparagus aethiopicus	Ground Asparagus Fern	Declared pest plant of the ACT
Asparagus africanus	Climbing Asparagus Fern	Declared pest plant of the ACT
Asparagus asparagoides	Bridal Creeper	Declared pest plant of the ACT
Asparagus asparagoides Western Cape Form	Bridal Creeper – Western Cape Form	Declared pest plant of the ACT
Asparagus declinatus	Bridal Veil	Declared pest plant of the ACT
Asparagus plumosa	Climbing Asparagus Fern	Declared pest plant of the ACT
Asparagus scandens	Asparagus Fern	Declared pest plant of the ACT
Austrocylindropuntia (ALL species)	Coral Cacti	Declared pest plant of the ACT
Cabomba caroliniana	Cabomba	Declared pest plant of the ACT
Carduus nutans	Nodding Thistle	Declared pest plant of the ACT
Carduus pycnocephalus	Slender Thistle	Declared pest plant of the ACT
Carduus tenuiflorus	Slender Thistle	Declared pest plant of the ACT
Carthamus lanatus	Saffron Thistle	Declared pest plant of the ACT
Celtis australis	Nettle Tree	Declared pest plant of the ACT
Centaurea maculosa	Spotted Knapweed	Declared pest plant of the ACT
Chrysanthemoides monilifera	Bitou Bush / Boneseed	Declared pest plant of the ACT
Cortaderia jubata	Pampas Grass	Declared pest plant of the ACT
Cortaderia selloana	Pampas Grass	Declared pest plant of the ACT
Cotoneaster franchettii	Cotoneaster	Declared pest plant of the ACT
Cotoneaster glaucophyllus	Cotoneaster	Declared pest plant of the ACT
Cotoneaster pannosus	Cotoneaster	Declared pest plant of the ACT
Cotoneaster salicifolius	Willow-leaf Cotoneaster	Declared pest plant of the ACT
Cotoneaster simonsii	Cotoneaster	Declared pest plant of the ACT

Botanical Name	Common Name	Reason
Crataegus monogyna	Hawthorn	Declared pest plant of the ACT
Cryptostegia grandiflora	Rubber Vine	Declared pest plant of the ACT
Cylindropuntia (ALL species)	Pear Cacti	Declared pest plant of the ACT
Cytisus (ALL species)	Broom species	Declared pest plant of the ACT
Echium plantagineum	Paterson's Curse	Declared pest plant of the ACT
Echium vulgare	Viper's Bugloss	Declared pest plant of the ACT
Eichornia crassipes	Water Hyacinth	Declared pest plant of the ACT
Equisetum species	Horsetail	Declared pest plant of the ACT
Eragrostis curvula	African Love Grass	Declared pest plant of the ACT
Genista (ALL species)	Broom species	Declared pest plant of the ACT
Gymnocoronis spilanthoides	Senegal Tea Plant	Declared pest plant of the ACT
Hedera helix	English Ivy	Declared pest plant of the ACT
Hieracium aurantiacum	Orange Hawkweed	Declared pest plant of the ACT
Hieracium pilosella	Mouse-ear Hawkweed	Declared pest plant of the ACT
Hymenachne amplexicaulis	Hymenachne	Declared pest plant of the ACT
Hypericum perforatum	St John's Wort	Declared pest plant of the ACT
Jatropha gossypiifolia	Bellyache Bush	Declared pest plant of the ACT
Kochia scoparia	Kochia	Declared pest plant of the ACT
Lagarosiphon major	Lagarosiphon	Declared pest plant of the ACT
Lantana camara	Lantana	Declared pest plant of the ACT
Ligustrum lucidum	Broad-leaf privet	Declared pest plant of the ACT
Ligustrum sinense	Narrow-leaf privet	Declared pest plant of the ACT
Lonicera japonica	Japanese Honeysuckle	Declared pest plant of the ACT
Lycium ferocissimum	African Boxthorn	Declared pest plant of the ACT
Macfadyena unguis-cati	Cat's Claw Creeper	Declared pest plant of the ACT
Mimosa pigra	Mimosa	Declared pest plant of the ACT
Miscanthus sinensis (ALL varieties)	Chinese Fairy Grass	Declared pest plant of the ACT
Myriophyllum aquaticum	Parrot's Feather	Declared pest plant of the ACT
Nasella tenuissima	Mexican Feather Grass	Declared pest plant of the ACT
Nassella charruana	Lobed Needlegrass	Declared pest plant of the ACT
Nassella neesiana	Chilean Needle Grass	Declared pest plant of the ACT
Nassella trichotoma	Serrated Tussock	Declared pest plant of the ACT
Onopordum acanthium	Scotch Thistle	Declared pest plant of the ACT
Onopordum illyricum	Illyrian Thistle	Declared pest plant of the ACT
Opuntia (ALL species) (excludes O. ficus-indica)		
Prickly Pears	Declared pest plant of the ACT	
Parkinsonia aculeata	Parkinsonia	Declared pest plant of the ACT
Parthenium hysterophorus	Parthenium Weed	Declared pest plant of the ACT
Pennisetum setaceum	African Fountain Grass	Declared pest plant of the ACT

Botanical Name	Common Name	Reason
Phyllostachys aurea	Yellow Bamboo	Declared pest plant of the ACT
Pinus radiata	Radiata Pine	Declared pest plant of the ACT
Pistia stratiotes	Water Lettuce	Declared pest plant of the ACT
Populus alba	White Poplar	Declared pest plant of the ACT
Populus nigra 'Italica'	Lombardy Poplar	Declared pest plant of the ACT
Prosopis spp.	Mesquite	Declared pest plant of the ACT
Pyracantha angustifolia	Firethorn	Declared pest plant of the ACT
Pyracantha coccinea	Scarlet Firethorn	Declared pest plant of the ACT
Pyracantha fortuneana	Firethorn	Declared pest plant of the ACT
Robinia pseudoacacia	False Acacia	Declared pest plant of the ACT
Rosa rubiginosa	Sweet Briar, Briar Rose	Declared pest plant of the ACT
Rubus fruticosus (aggregate) All species except for the permitted cultivars: R. armeniacus and R. ulmifolius species hybrid R. armeniacus species hybrid R. ursinus and R. armeniacus species hybrid	All Blackberry except for the permitted cultivars: Black Satin, Chester Thornless, Dirksen Loch Ne and Chehale.	Declared pest plant of the ACT
Sagittaria platyphylla	Sagittaria	Declared pest plant of the ACT
Salix ALL species of willow, except for the permitted species: Salix babylonica S. babylonica S. caladendron S. reichardtii	All Willows except for the permitted species: Weeping Willow Weeping Willow Pussy Willow Sterile Pussy Willow	Declared pest plant of the ACT
Salvinia molesta	Salvinia	Declared pest plant of the ACT
Senecio madagascariensis	Fireweed	Declared pest plant of the ACT
Solanum elaeagnifolium	Silverleaf Nightshade	Declared pest plant of the ACT
Sorbus sp.	Service Tree, Rowan	Declared pest plant of the ACT
Spartium junceum	Spanish Broom	Declared pest plant of the ACT
Tamarix aphylla	Athel Pine	
Toxicodendron succedaneum	Rhus Tree	Declared pest plant of the ACT
Ulex europaeus	Gorse	Declared pest plant of the ACT
Vinca major	Periwinkle	Declared pest plant of the ACT
Xanthium occidentale	Noogoora Burr	Declared pest plant of the ACT
Xanthium spinosum	Bathurst Burr	Declared pest plant of the ACT
Landscaping Plant Species		
Agapanthus species	Agapanthus	Multiple varieties where the seed is easily distributed and forms dense monocultures in conservation areas

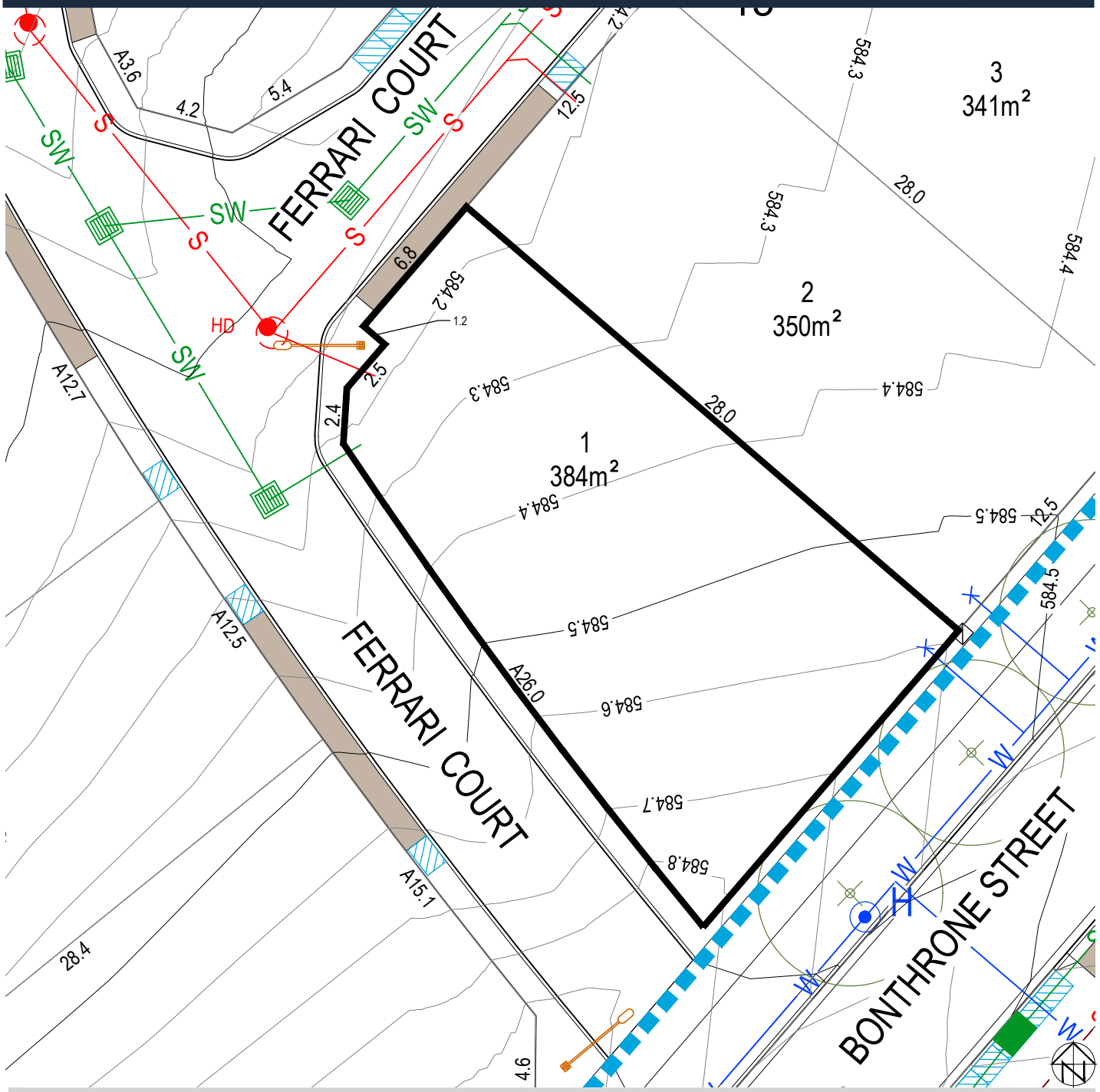
Botanical Name	Common Name	Reason
Nandina domestica	Sacred Bamboo	Berries toxic to birds, seed easily distributed into the conservation zone
Photinia species	Photinia	Seed easily distributed into conservation zone
Wisteria sinensis	Chinese Wisteria	Spread by seed, particularly along established waterways

Appendix C

Ginninderry

Stage 1A
TRADITIONAL STREETSCAPE
Section: 15 (AH)
Block: 1 (c)

Block Disclosure Plan



BLOCK LAYOUT - SCALE 1:250 ISSUE DATE:05/09/2018

LEGEND

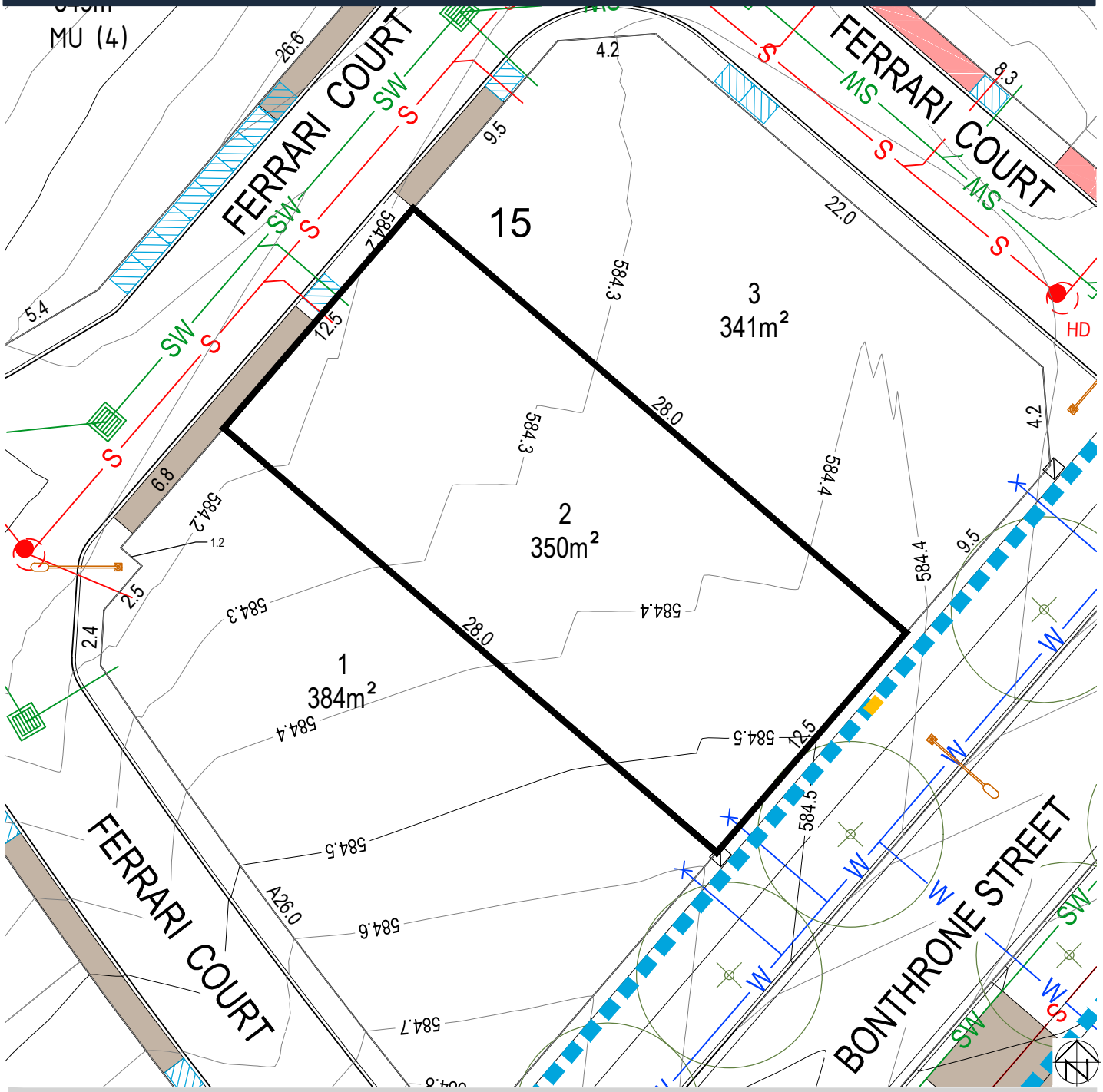
- LOT BOUNDARY
- EASEMENT
- 550.0 CONTOUR 0.5m INTERVAL
- CONTOUR 0.1m INTERVAL
- RETAINING WALL
- 2 MANDATORY TWO(2) STOREYS
- SEWER MAINTENANCE ACCESS ROUTE REQUIRED
- SEWER MAIN / MANHOLE / TIE
- STORMWATER MAIN / SUMP / MANHOLE / TIE
- WATER MAIN / STOP VALVE / HYDRANT / TIE
- WATER MAIN (IRRIGATION)
- REINFORCED CONCRETE DRIVEWAY BY PURCHASER
- POTENTIALLY NOISE AFFECTED BLOCK
- SERVICES TRENCH
- NBNCo. PIT
- STREETLIGHT
- ABOVE GROUND MINIPILLAR
- IN GROUND MINIPILLAR
- FRONT FENCING AND GATE BY DEVELOPER
- WASTE COLLECTION POINT
- SUBSTATION
- STREET TREES
- 1.0 GARAGE OFFSET FROM REAR BOUNDARY
- # BLOCK SUBJECT TO MID-SIZED PROVISIONS

PLEASE NOTE: INFORMATION SHOWN IN THIS DRAWING IS FROM FINAL DESIGN AND SUBJECT TO CHANGE DURING CONSTRUCTION
REFER ALSO TO PLANNING CONTROLS PLAN AND FENCING CONTROLS PLAN

Ginninderry

Stage 1A
TRADITIONAL STREETSCAPE
Section: 15 (AH)
Block: 2 (b)

Block Disclosure Plan



BLOCK LAYOUT - SCALE 1:250

ISSUE DATE:05/09/2018

LEGEND

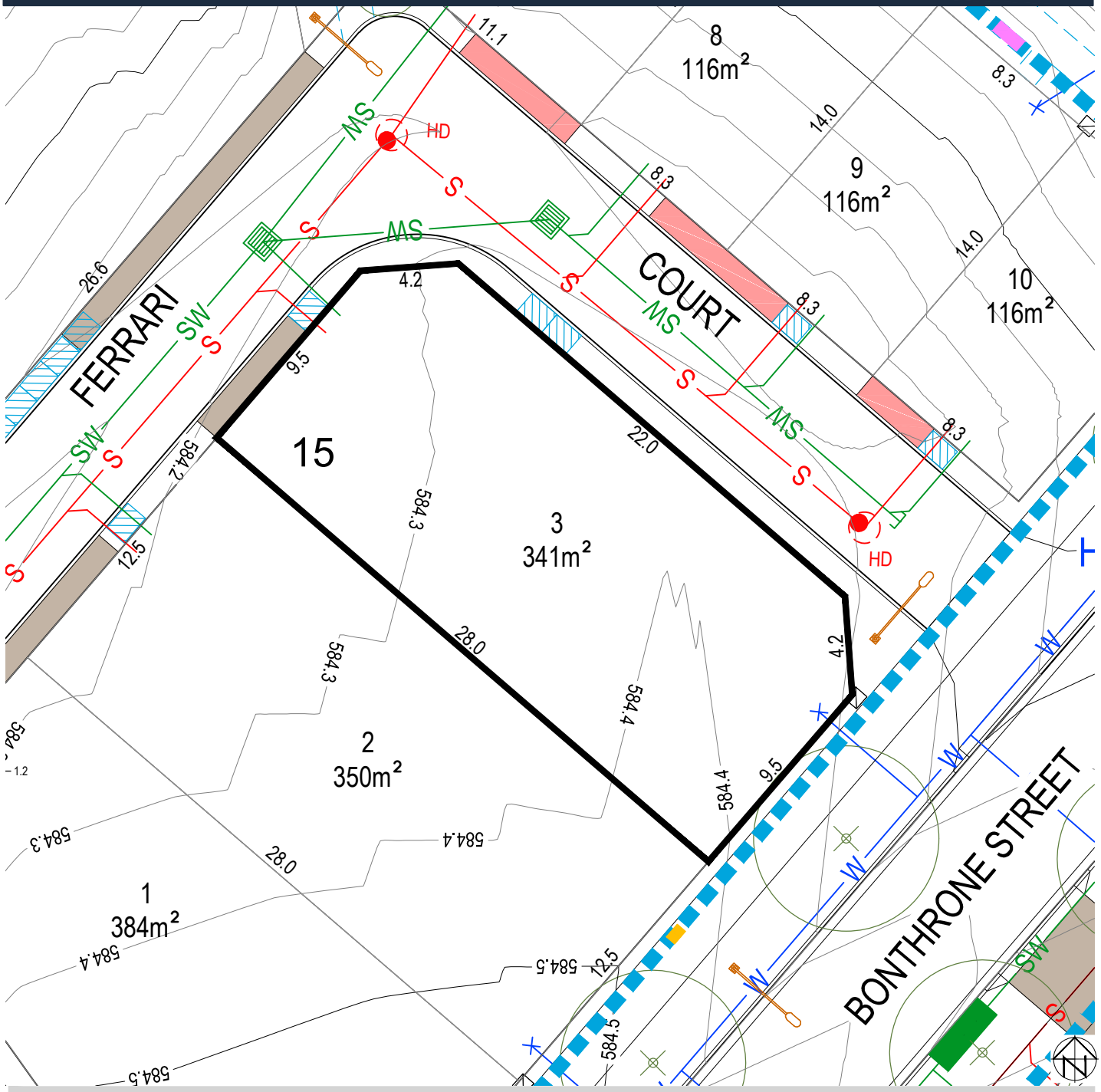
- LOT BOUNDARY
- EASEMENT
- 550.0 CONTOUR 0.5m INTERVAL
- CONTOUR 0.1m INTERVAL
- RETAINING WALL
- 2 MANDATORY TWO(2) STOREYS
- SEWER MAINTENANCE ACCESS ROUTE REQUIRED
- SEWER MAIN / MANHOLE / TIE
- STORMWATER MAIN / SUMP / MANHOLE / TIE
- WATER MAIN / STOP VALVE / HYDRANT / TIE
- WATER MAIN (IRRIGATION)
- REINFORCED CONCRETE DRIVEWAY BY PURCHASER
- POTENTIALLY NOISE AFFECTED BLOCK
- SERVICES TRENCH
- NBNCo. PIT
- STREETLIGHT
- ABOVE GROUND MINIPILLAR
- IN GROUND MINIPILLAR
- FRONT FENCING AND GATE BY DEVELOPER
- WASTE COLLECTION POINT
- SUBSTATION
- STREET TREES
- 1.0 GARAGE OFFSET FROM REAR BOUNDARY
- # BLOCK SUBJECT TO MID-SIZED PROVISIONS

PLEASE NOTE: INFORMATION SHOWN IN THIS DRAWING IS FROM FINAL DESIGN AND SUBJECT TO CHANGE DURING CONSTRUCTION
REFER ALSO TO PLANNING CONTROLS PLAN AND FENCING CONTROLS PLAN

Ginninderry

Stage 1A
TRADITIONAL STREETSCAPE
Section: 15 (AH)
Block: 3 (a)

Block Disclosure Plan



BLOCK LAYOUT - SCALE 1:250 ISSUE DATE:05/09/2018

LEGEND

- LOT BOUNDARY
- EASEMENT
- 550.0 CONTOUR 0.5m INTERVAL
- CONTOUR 0.1m INTERVAL
- RETAINING WALL
- 2 MANDATORY TWO(2) STOREYS
- SEWER MAINTENANCE ACCESS ROUTE REQUIRED
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REFER ALSO TO PLANNING CONTROLS PLAN AND FENCING CONTROLS PLAN

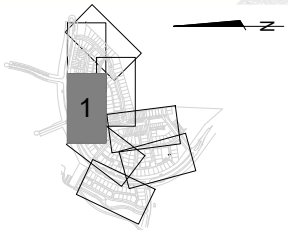
Appendix D

WARNING

THIS PLAN ONLY INDICATES AREAS OF FILL OF WHICH THE DEVELOPER AND THEIR AGENTS ARE AWARE. IT HAS NOT BEEN CHECKED BY THE DEVELOPER, AND THE DEVELOPER DOES NOT GUARANTEE ITS ACCURACY. IN NO WAY SHOULD THIS PLAN BE READ AS A CONCLUSIVE STATEMENT OF THE FULL EXTENT OF THE FILL THAT MAY BE FOUND ON THE WHOLE LAND DEPICTED. LESSEES AND PURCHASERS SHOULD MAKE THEIR OWN INQUIRIES IN REGARD TO THE EXACT DRAINAGE, GEOTECHNICAL AND FILL CONDITIONS AFFECTING THEIR BLOCKS.

LEGEND

- GRADING LIMITS
- FILL
- DESIGN CONTOURS @ 1m INTERVALS
- × 0.3 — FILL DEPTHS (IN METRES)



FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
	SB	DC			

DRAFT

AMENDMENTS — AMENDMENT DETAILS

GROUPGSA — Cia landscapes + colour

WAE No.

PROJECT No.

SCALE (METRES) 5 0 5 10 15 20 25 — 1:1000

CLIENT: Ginninderry

PROJECT: GINNINDERRY STAGE 1A, 1B & 1C

calibre CONSULTING www.calibreconsulting.co

DRAWING TITLE: BLOCK FILL PLANS STAGE 1A - SHEET 1 OF 5 SECTIONS AH, AI & AQ

DRAWING NUMBER: 15-004671-FB01

AMEND.

Appendix E

SITE CLASSIFICATION REPORT SUMMARY

BLOCK:	**1 (c)**	**SECTION:**	**15 (AH)**	**SUBURB:**	**Strathnairn**
JOB No:	**77356.22**			**DATE:**	**October 2018**
CLIENT:	**Calibre Consulting (ACT) Pty Ltd**				

CLASSIFICATION PROCEDURES:

EXISTING SUBSURFACE CONDITIONS:

Test Pit 16: Gravelly sand filling to 0.05 m depth overlying granodiorite to the slow progress depth of 0.7 m.

Test Pit 17: Granodiorite with some clay seams to the slow progress depth of 1.3 m.

LABORATORY RESULTS: Previous laboratory results indicated liquid limit ranging from 52-81%, plasticity index ranging from 39-68% and linear shrinkage ranging from 13.5-22.5%

SITE CLASSIFICATION: **Class S (slightly reactive)** based on limited subsurface information and determined in general accordance with the requirements of AS2870-2011 (Ref 1). If the building pad is founded entirely on weathered rock, a Class A classification may be appropriate. Therefore the classification must be reassessed should the soil profile change either by adding fill or removing soil from the block and/or if the presence of service trenches or retaining walls are within the zone of influence of the block. Reference should be made to the comments provided below.

FOOTING SYSTEMS: Reference must be made to AS2870-2011 (Ref 1) which indicates footing systems that are appropriate for each site classification. All footings must found within a uniform bearing stratum of suitable strength/material, below the zone of influence of any service trenches, backfill zones, retaining walls or underground structures. Masonry walls should be articulated in accordance with current best practice. Footing systems must be confirmed by a structural engineer taking into consideration any onsite or offsite constraints.

MAINTENANCE GUIDELINES: CSIRO Sheet BTF 18 'Foundation Maintenance & Footing Performance' (attached). Refer to comments about gardens, landscaping and trees on the performance of foundation soils.

COMMENTS/ LIMITATIONS:

The successful purchaser must make their own interpretations, deductions and conclusions from the information made available and will need to accept full responsibility for such interpretations, deductions and conclusions.

Development specific geotechnical investigations must be undertaken.

Additional topsoils / filling may have been spread subsequent to the investigation.

Site preparation prior to the construction should include removal of all vegetation, topsoil and any uncontrolled filling.

All new filling must be placed under controlled conditions (AS 3798-2007). If filling is placed uncontrolled, those areas would require a Class P site classification.

Some variability in subsurface conditions must be anticipated.

Moisture condition of site soils and/or the presence of groundwater may vary considerably from time of investigation compared to at the time of construction.

Hard rock excavation must be anticipated.

It is recommended that footing excavations be inspected by a geotechnical engineer.

This report must be read in conjunction with the attached notes "Limitations", "About this Report", "Drawing 3", "Explanatory Notes" and "Test Pit Logs (16 and 17)".

REFERENCES:

1. AS 2870-2011 'Residential Slabs and Footings,' Standards Association of Australia.

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Geotechnics / Environment / Groundwater

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Limitations

Douglas Partners (DP) has prepared this report for this project at Stage 1 Strathnairn in accordance with DP's proposal dated 9 August 2017 and acceptance received from Calibre Consulting (ACT) Pty Ltd dated 29 September 2018. The work was carried out under an amended Calibre Consulting (ACT) Pty Ltd Professional Services Agreement. This report is provided for the exclusive use of Calibre Consulting (ACT) Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the geotechnical components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole 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. They may not be the same at the time of construction as are indicated in the report; and
- 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 first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or 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 a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP 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 and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

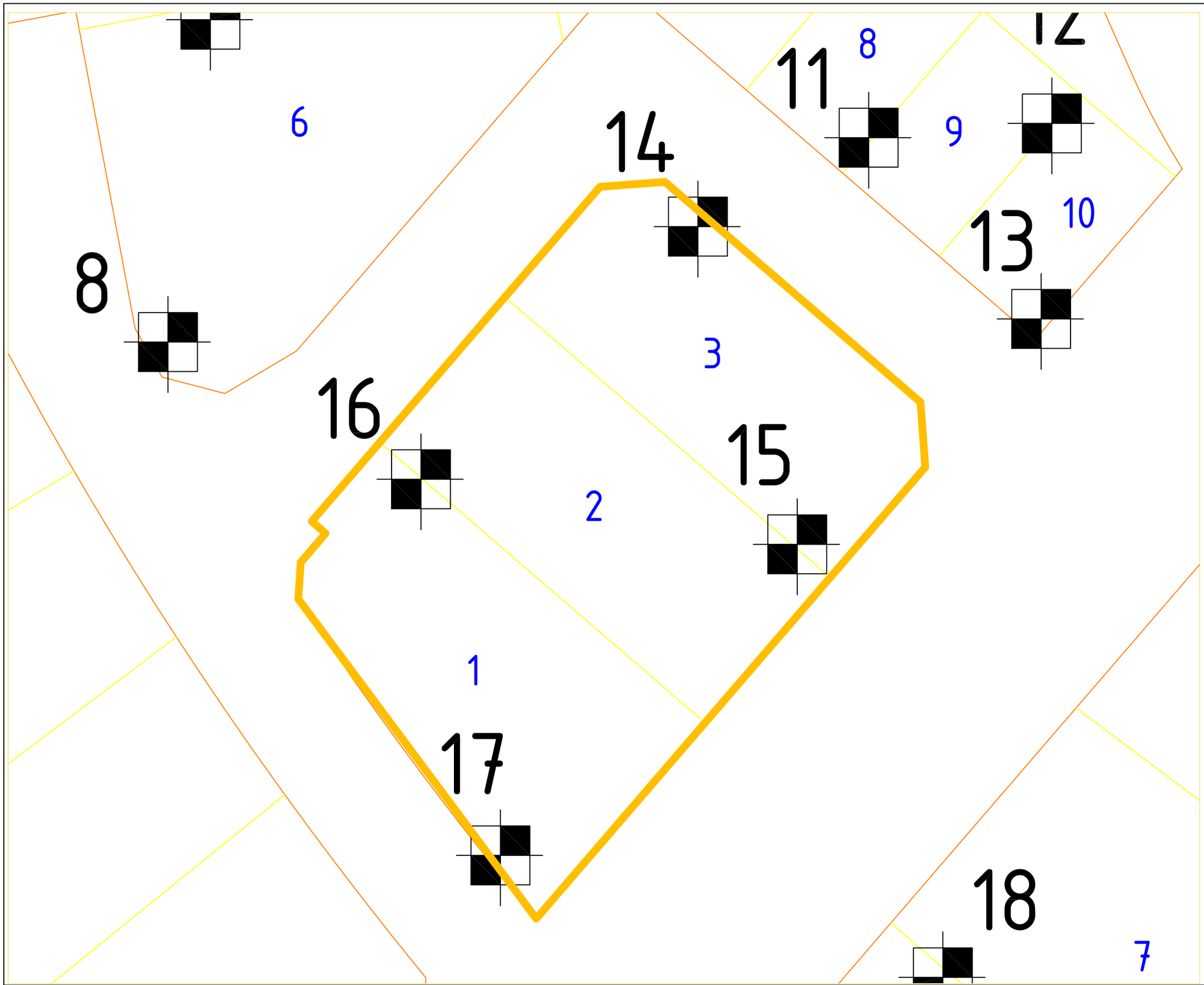
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

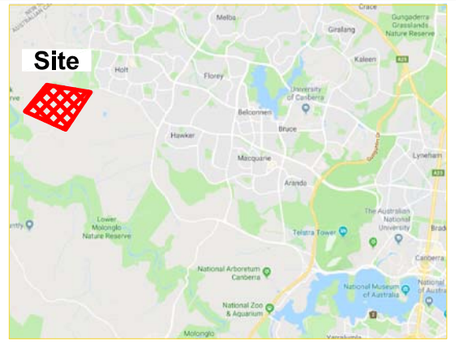
Information for Contractual Purposes

Where information obtained from this report 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. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.





Locality Plan

LEGEND

- Test Pit Location
- 6 Block Number
- Block Boundary
- Section Boundary

NOTE: Base drawing from Calibre Consulting (ACT) Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Calibre Consulting (ACT) Pty Ltd		TITLE: **Test Pit Location Plan**	PROJECT No: 77356.22
OFFICE: Canberra	DRAWN BY: SDG	**Strathnairn Stage 1**	DRAWING No: 3
SCALE: NTS	DATE: 18.09.2018	**Blocks 1 - 3 Section 15, Strathnairn**	REVISION: 0

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil 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.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud 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 the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils 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 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm 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 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This 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.

Soil Descriptions

Douglas Partners

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 2007. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approximate Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and longer sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq \text{100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

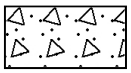
Symbols & Abbreviations

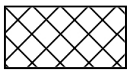
Graphic Symbols for Soil and Rock

General

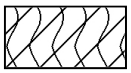

Asphalt

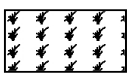

Road base

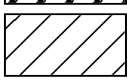

Concrete


Filling

Soils


Topsoil

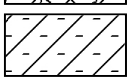

Peat


Clay


Silty clay

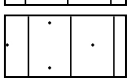

Sandy clay

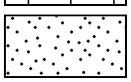

Gravelly clay

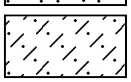

Shaly clay

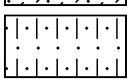

Silt


Clayey silt


Sandy silt

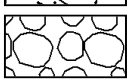

Sand


Clayey sand


Silty sand


Gravel

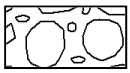

Sandy gravel


Cobbles, boulders

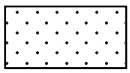

Talus

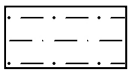
Sedimentary Rocks

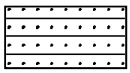

Boulder conglomerate

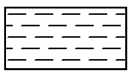

Conglomerate


Conglomeratic sandstone

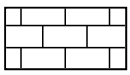

Sandstone


Siltstone

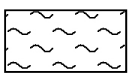

Laminite

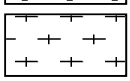

Mudstone, claystone, shale

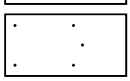

Coal


Limestone

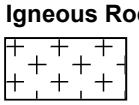
Metamorphic Rocks

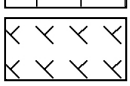

Slate, phyllite, schist

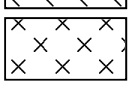

Gneiss

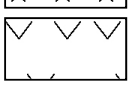

Quartzite

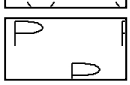
Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

TEST PIT LOG

CLIENT: Calibre Consulting (ACT) Pty Ltd
PROJECT: Ginnindery Residential Development
LOCATION: Strathnairn Stage 1

SURFACE LEVEL: 584.2 AHD
EASTING: 198723.88
NORTHING: 609415.89

PIT No: 16
PROJECT No: 77356.22
DATE: 12/9/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
584	0.05	FILLING-generally comprising loose, dry to moist, brown, fine to coarse grained gravelly sand							
		GRANODIORITE-extremely low to low strength, extremely to highly weathered, orange/brown, fine to coarse grained granodiorite		D	0.6				
	0.7	Pit discontinued at 0.7m -slow progress							
	1								1
583									
	2								2
582									

RIG: Kubota KX057-4 mini-excavator, 300mm bucket

LOGGED: SDG

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics | Environment | Groundwater

TEST PIT LOG

CLIENT: Calibre Consulting (ACT) Pty Ltd
PROJECT: Ginnindery Residential Development
LOCATION: Strathnairn Stage 1

SURFACE LEVEL: 584.8 AHD
EASTING: 198728.96
NORTHING: 609391.37

PIT No: 17
PROJECT No: 77356.22
DATE: 12/9/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
584	0	GRANODIORITE-extremely low strength, extremely weathered, grey/orange brown, fine to coarse grained granodiorite with some clay seams							
	1	-from 0.25m, very low strength, highly weathered		D	1.2				1
	1.3	Pit discontinued at 1.3m -slow progress							
583	2								2
582									

RIG: Kubota KX057-4 mini-excavator, 300mm bucket

LOGGED: SDG

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics | Environment | Groundwater

Foundation Maintenance and Footing Performance:
A Homeowner's Guide

CSIRO

BTF 18 replaces Information Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction
There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion
All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation
This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil
All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure
This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth
Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- **Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.**
- **Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.**

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation
Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

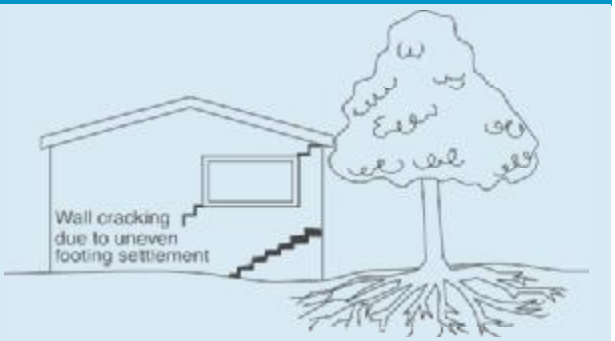
Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

Seasonal swelling/shrinkage in clay
Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

Trees can cause shrinkage and damage



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots
In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself
Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures
Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures
Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures
Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing
Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage
In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

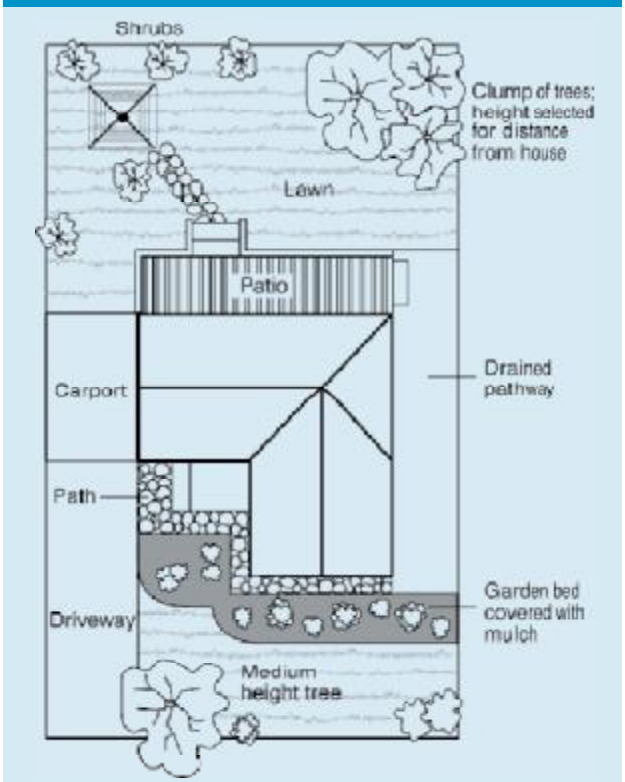
Protection of the building perimeter
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4

Gardens for a reactive site



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

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SITE CLASSIFICATION REPORT SUMMARY

BLOCK:	**2 (b)**	**SECTION:**	**15 (AH)**	**SUBURB:**	**Strathnairn**
JOB No:	**77356.22**			**DATE:**	**October 2018**
CLIENT:	**Calibre Consulting (ACT) Pty Ltd**				

CLASSIFICATION PROCEDURES:

EXISTING SUBSURFACE CONDITIONS:

Test Pit 15: Gravelly sand filling to 0.5 m depth, then clay with trace sand to 0.7 m depth overlying granodiorite to the slow progress depth of 1.1 m.

Test Pit 16: Gravelly sand filling to 0.05m depth overlying granodiorite to the slow progress depth of 0.7 m.

BULK EARTHWORKS: Filling within the block was placed under Level 1 control as defined in AS 3798 – 2007 (Ref 1).

LABORATORY RESULTS: Previous laboratory results indicated liquid limit ranging from 52-81%, plasticity index ranging from 39-68% and linear shrinkage ranging from 13.5-22.5%

SITE CLASSIFICATION: **Class S* (slightly reactive/filled block)** based on limited subsurface information and determined in general accordance with the requirements of AS2870-2011 (Ref 1) inclusive of additional ground movements resulting from the presence of former and existing trees. If the building pad is founded entirely on weathered rock, a Class A classification may be appropriate. Therefore the classification must be reassessed should the soil profile change either by adding fill or removing soil from the block and/or if the presence of service trenches or retaining walls are within the zone of influence of the block.

FOOTING SYSTEMS: Reference must be made to AS2870-2011 (Ref 2) which indicates footing systems that are appropriate for each site classification. All footings must found within a uniform bearing stratum of suitable strength/material, below the zone of influence of any service trenches, backfill zones, retaining walls or underground structures. Masonry walls should be articulated in accordance with current best practice. Footing systems must be confirmed by a structural engineer taking into consideration any onsite or offsite constraints.

MAINTENANCE GUIDELINES: CSIRO Sheet BTF 18 'Foundation Maintenance & Footing Performance' (attached). Refer to comments about gardens, landscaping and trees on the performance of foundation soils.

COMMENTS/ LIMITATIONS:

The successful purchaser must make their own interpretations, deductions and conclusions from the information made available and will need to accept full responsibility for such interpretations, deductions and conclusions.

Development specific geotechnical investigations must be undertaken.

Additional topsoils / filling may have been spread subsequent to the investigation.

Site preparation prior to the construction should include removal of all vegetation, topsoil and any uncontrolled filling.

All new filling must be placed under controlled conditions (AS 3798-2007). If filling is placed uncontrolled, those areas would require a Class P site classification.

Some variability in subsurface conditions must be anticipated.

Moisture condition of site soils and/or the presence of groundwater may vary considerably from time of investigation compared to at the time of construction.

Hard rock excavation must be anticipated.

It is recommended that footing excavations be inspected by a geotechnical engineer.

This report must be read in conjunction with the attached notes "Limitations", "About this Report", "Drawing 3", "Explanatory Notes" and "Test Pit Logs (15 and 16)".

REFERENCES:

1. AS 3798-2007 'Guidelines on Earthworks for Commercial and Residential Developments', Standards Association of Australia.
2. AS 2870-2011 'Residential Slabs and Footings,' Standards Association of Australia.

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Limitations

Douglas Partners (DP) has prepared this report for this project at Stage 1 Strathnairn in accordance with DP's proposal dated 9 August 2017 and acceptance received from Calibre Consulting (ACT) Pty Ltd dated 29 September 2018. The work was carried out under an amended Calibre Consulting (ACT) Pty Ltd Professional Services Agreement. This report is provided for the exclusive use of Calibre Consulting (ACT) Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the geotechnical components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole 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. They may not be the same at the time of construction as are indicated in the report; and
- 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 first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or 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 a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP 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 and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

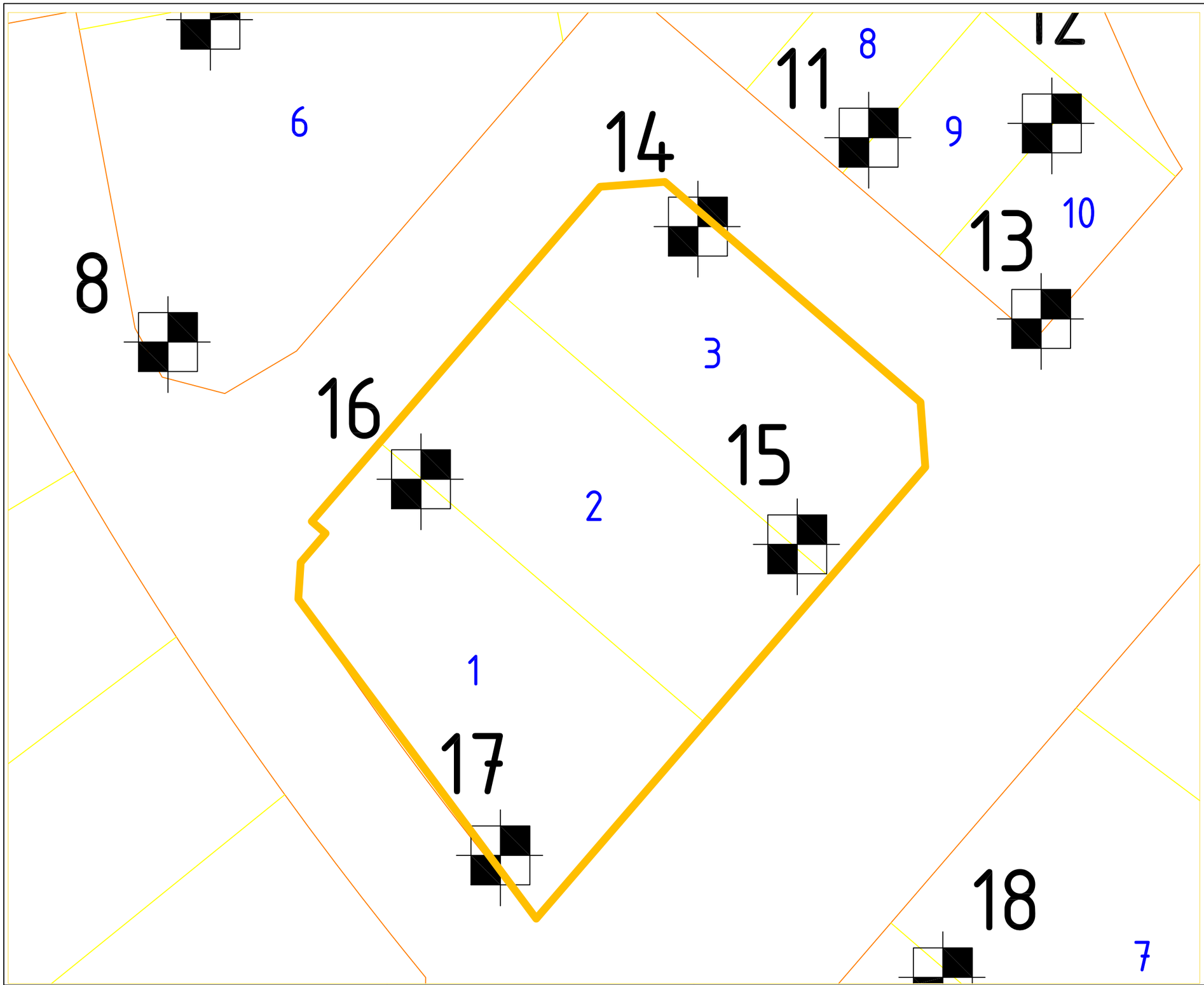
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

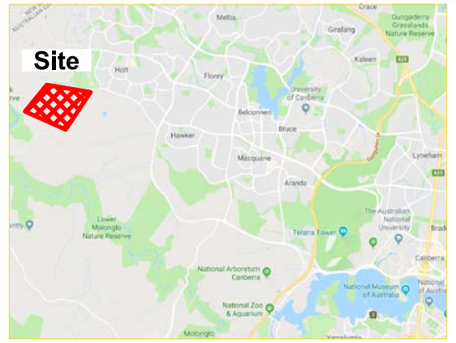
Information for Contractual Purposes

Where information obtained from this report 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. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.





Locality Plan

LEGEND

- Test Pit Location
- 6 Block Number
- Block Boundary
- Section Boundary

NOTE: Base drawing from Calibre Consulting (ACT) Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Calibre Consulting (ACT) Pty Ltd		TITLE: **Test Pit Location Plan**	PROJECT No: 77356.22
OFFICE: Canberra	DRAWN BY: SDG	**Strathnairn Stage 1**	DRAWING No: 3
SCALE: NTS	DATE: 18.09.2018	**Blocks 1 - 3 Section 15, Strathnairn**	REVISION: 0

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil 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.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud 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 the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils 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 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm 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 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This 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.

Soil Descriptions

Douglas Partners

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 2007. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approximate Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and longer sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq \text{100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

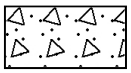
Symbols & Abbreviations

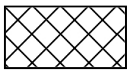
Graphic Symbols for Soil and Rock

General

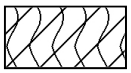

Asphalt

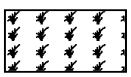

Road base

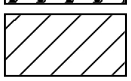

Concrete


Filling

Soils


Topsoil

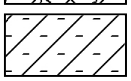

Peat


Clay


Silty clay

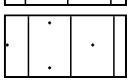

Sandy clay

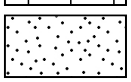

Gravelly clay

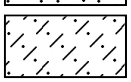

Shaly clay

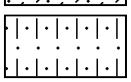

Silt


Clayey silt


Sandy silt

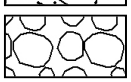

Sand


Clayey sand


Silty sand


Gravel

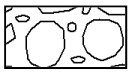

Sandy gravel


Cobbles, boulders

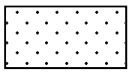

Talus

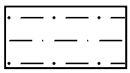
Sedimentary Rocks

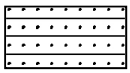

Boulder conglomerate

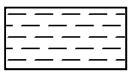

Conglomerate


Conglomeratic sandstone

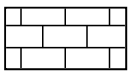

Sandstone


Siltstone

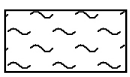

Laminite

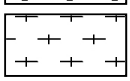

Mudstone, claystone, shale

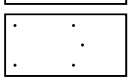

Coal


Limestone

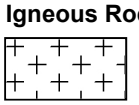
Metamorphic Rocks

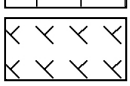

Slate, phyllite, schist

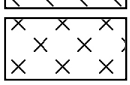

Gneiss

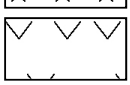

Quartzite

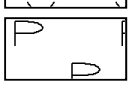
Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

TEST PIT LOG

CLIENT: Calibre Consulting (ACT) Pty Ltd
PROJECT: Ginnindery Residential Development
LOCATION: Strathnairn Stage 1

SURFACE LEVEL: 584.4 AHD
EASTING: 198748.32
NORTHING: 609411.34

PIT No: 15
PROJECT No: 77356.22
DATE: 12/9/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
584	0.5	FILLING-generally comprising loose, dry to moist, brown, fine to coarse grained gravelly sand		D	0.2		pp >400		
	0.7	CLAY-hard, dry to moist, yellow brown, high plasticity clay with trace sand							
	1	GRANODIORITE-very low strength, extremely weathered, orange/brown, fine to coarse grained granodiorite -from 0.9m, moderately weathered		D	1.0				1
583	1.1	Pit discontinued at 1.1m -slow progress							
	2								2
582									

RIG: Kubota KX057-4 mini-excavator, 300mm bucket

LOGGED: SDG

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics | Environment | Groundwater

TEST PIT LOG

CLIENT: Calibre Consulting (ACT) Pty Ltd
PROJECT: Ginnindery Residential Development
LOCATION: Strathnairn Stage 1

SURFACE LEVEL: 584.2 AHD
EASTING: 198723.88
NORTHING: 609415.89

PIT No: 16
PROJECT No: 77356.22
DATE: 12/9/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
584	0.05	FILLING-generally comprising loose, dry to moist, brown, fine to coarse grained gravelly sand							
		GRANODIORITE-extremely low to low strength, extremely to highly weathered, orange/brown, fine to coarse grained granodiorite		D	0.6				
	0.7	Pit discontinued at 0.7m -slow progress							
	1								1
583									
	2								2
582									

RIG: Kubota KX057-4 mini-excavator, 300mm bucket

LOGGED: SDG

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Foundation Maintenance and Footing Performance:
A Homeowner's Guide

CSIRO

BTF 18 replaces Information Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction
There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion
All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation
This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil
All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure
This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth
Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- **Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.**
- **Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.**

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation
Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

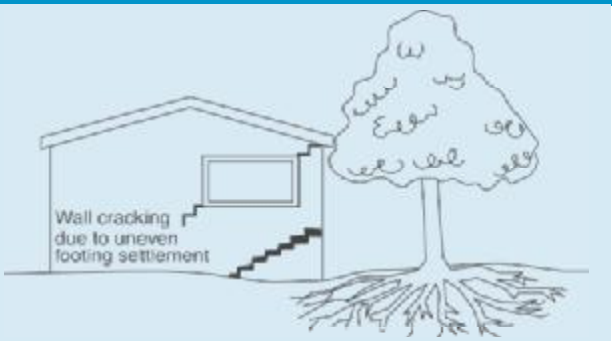
Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

Seasonal swelling/shrinkage in clay
Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

Trees can cause shrinkage and damage



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots
In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself
Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures
Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures
Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures
Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing
Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage
In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

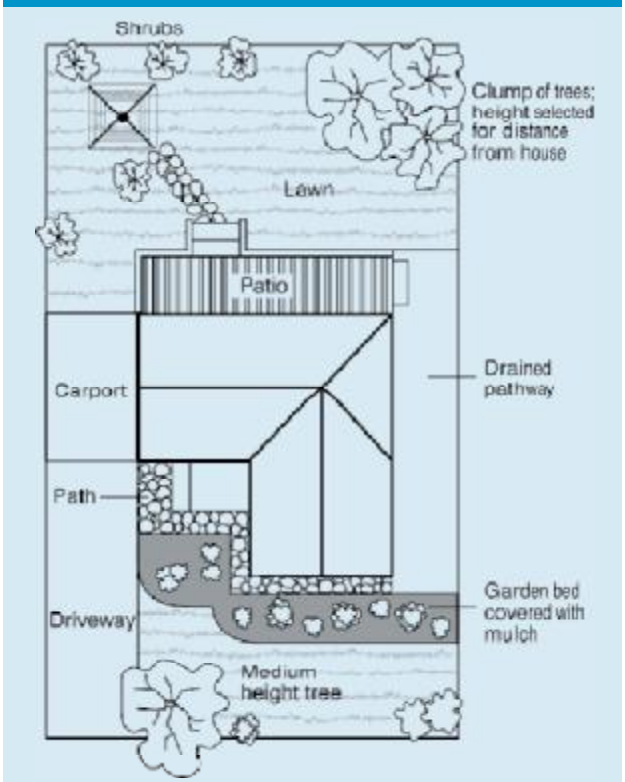
Protection of the building perimeter
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4

Gardens for a reactive site



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

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SITE CLASSIFICATION REPORT SUMMARY

BLOCK:	**3 (a)**	**SECTION:**	**15 (AH)**	**SUBURB:**	**Strathnairn**
JOB No:	**77356.22**			**DATE:**	**October 2018**
CLIENT:	**Calibre Consulting (ACT) Pty Ltd**				

CLASSIFICATION PROCEDURES:

EXISTING SUBSURFACE CONDITIONS:

Test Pit 14: Gravelly sand filling to 0.1 m depth, then silty clay with ironstone nodules and staining to 0.8 m depth overlying silty clay with trace sand and some rock like structure to the limit of investigation depth of 1.9 m.

Test Pit 15: Gravelly sand filling to 0.5 m depth, then clay with trace sand to 0.7 m depth overlying granodiorite to the slow progress depth of 1.1 m.

BULK EARTHWORKS: Filling within the block was placed under Level 1 control as defined in AS 3798 – 2007 (Ref 1).

LABORATORY RESULTS: Previous laboratory results indicated liquid limit ranging from 52-81%, plasticity index ranging from 39-68% and linear shrinkage ranging from 13.5-22.5%

SITE CLASSIFICATION: **High range Class M* (moderately reactive/filled block)** based on the current soil profile/status, from limited subsurface information and determined in general accordance with the requirements of AS2870-2011 (Ref 2). The classification must be reassessed should the soil profile change either by adding fill or removing soil from the block and/or if the presence of service trenches or retaining walls are within the zone of influence of the block. Class H1 conditions may be warranted should the site be subject to cut. Reference should be made to the comments provided below.

FOOTING SYSTEMS: Reference must be made to AS2870-2011 (Ref 2) which indicates footing systems that are appropriate for each site classification. All footings must found within a uniform bearing stratum of suitable strength/material, below the zone of influence of any service trenches, backfill zones, retaining walls or underground structures. Masonry walls should be articulated in accordance with current best practice. Footing systems must be confirmed by a structural engineer taking into consideration any onsite or offsite constraints.

MAINTENANCE GUIDELINES: CSIRO Sheet BTF 18 'Foundation Maintenance & Footing Performance' (attached). Refer to comments about gardens, landscaping and trees on the performance of foundation soils.

COMMENTS/ LIMITATIONS:

The successful purchaser must make their own interpretations, deductions and conclusions from the information made available and will need to accept full responsibility for such interpretations, deductions and conclusions.

Development specific geotechnical investigations must be undertaken.

Additional topsoils / filling may have been spread subsequent to the investigation.

Site preparation prior to the construction should include removal of all vegetation, topsoil and any uncontrolled filling.

All new filling must be placed under controlled conditions (AS 3798-2007). If filling is placed uncontrolled, those areas would require a Class P site classification.

Some variability in subsurface conditions must be anticipated.

Moisture condition of site soils and/or the presence of groundwater may vary considerably from time of investigation compared to at the time of construction.

Hard rock excavation should be anticipated over parts of the site.

It is recommended that footing excavations be inspected by a geotechnical engineer.

This report must be read in conjunction with the attached notes "Limitations", "About this Report", "Drawing 3", "Explanatory Notes" and "Test Pit Logs (14 and 15)".

REFERENCES:

1. AS 3798-2007 'Guidelines on Earthworks for Commercial and Residential Developments', Standards Association of Australia.
2. AS 2870-2011 'Residential Slabs and Footings,' Standards Association of Australia.

Douglas Partners
Geotechnics / Environment / Groundwater

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Limitations

Douglas Partners (DP) has prepared this report for this project at Stage 1 Strathnairn in accordance with DP's proposal dated 9 August 2017 and acceptance received from Calibre Consulting (ACT) Pty Ltd dated 29 September 2018. The work was carried out under an amended Calibre Consulting (ACT) Pty Ltd Professional Services Agreement. This report is provided for the exclusive use of Calibre Consulting (ACT) Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the geotechnical components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole 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. They may not be the same at the time of construction as are indicated in the report; and
- 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 first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or 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 a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP 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 and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

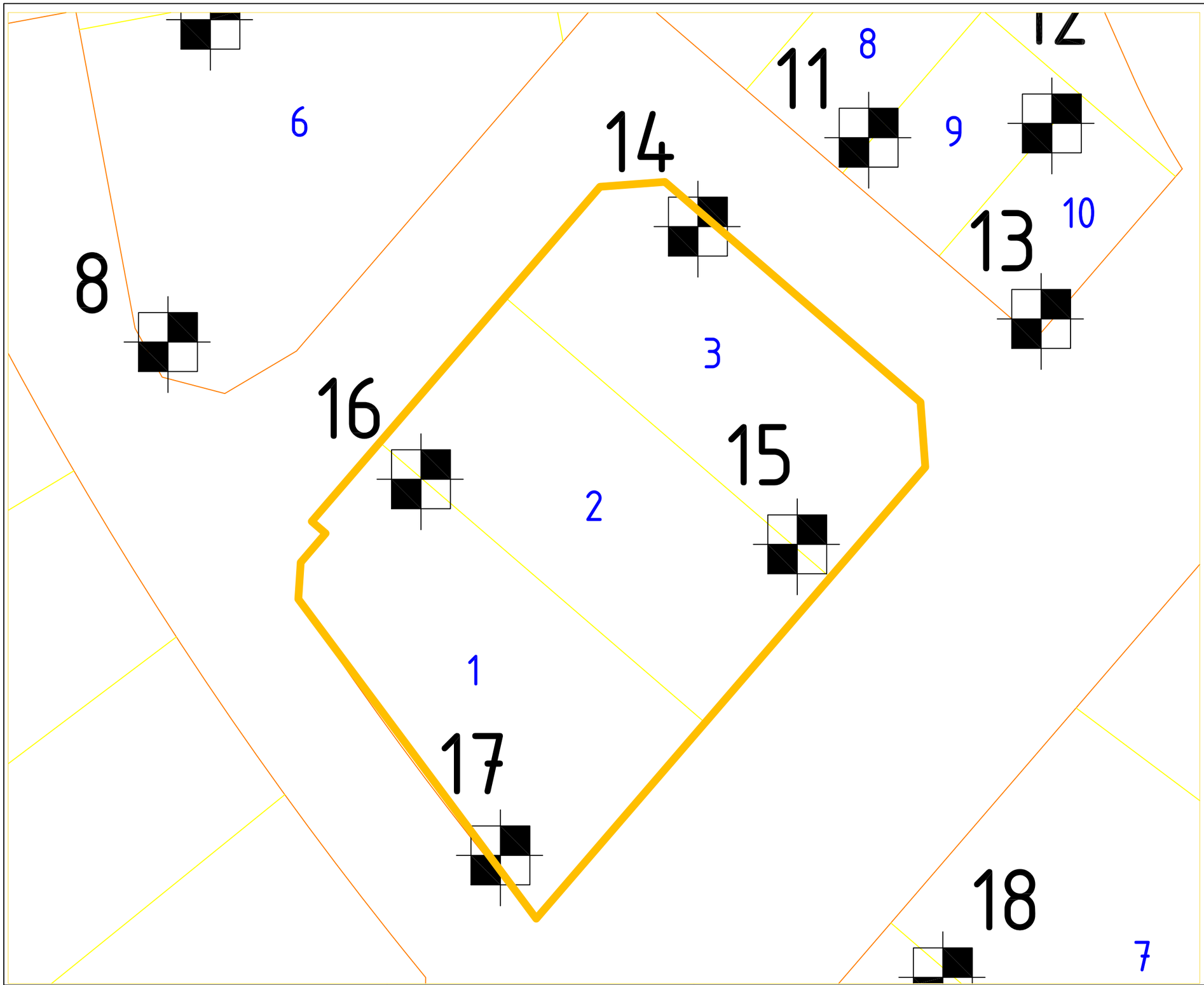
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

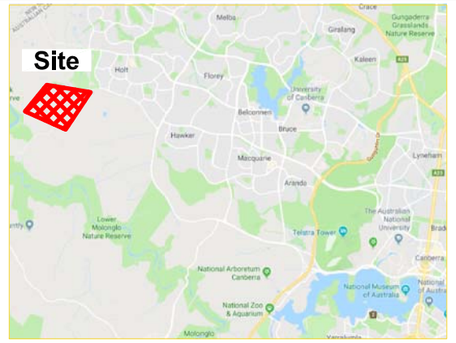
Information for Contractual Purposes

Where information obtained from this report 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. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.





Locality Plan

LEGEND

- Test Pit Location
- 6 Block Number
- Block Boundary
- Section Boundary

NOTE: Base drawing from Calibre Consulting (ACT) Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Calibre Consulting (ACT) Pty Ltd		TITLE: **Test Pit Location Plan**	PROJECT No: 77356.22
OFFICE: Canberra	DRAWN BY: SDG	**Strathnairn Stage 1**	DRAWING No: 3
SCALE: NTS	DATE: 18.09.2018	**Blocks 1 - 3 Section 15, Strathnairn**	REVISION: 0

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil 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.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud 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 the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils 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 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm 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 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This 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.

Soil Descriptions

Douglas Partners

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 2007. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approximate Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and longer sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq \text{100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

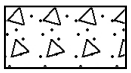
Symbols & Abbreviations

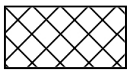
Graphic Symbols for Soil and Rock

General

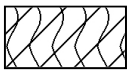

Asphalt

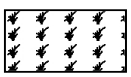

Road base

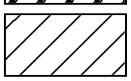

Concrete


Filling

Soils


Topsoil

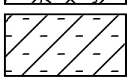

Peat


Clay


Silty clay

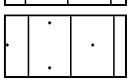

Sandy clay

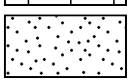

Gravelly clay

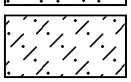

Shaly clay

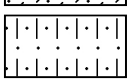

Silt


Clayey silt


Sandy silt

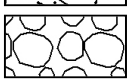

Sand


Clayey sand


Silty sand


Gravel

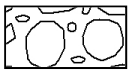

Sandy gravel


Cobbles, boulders

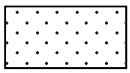

Talus

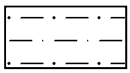
Sedimentary Rocks

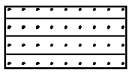

Boulder conglomerate

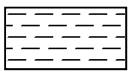

Conglomerate


Conglomeratic sandstone

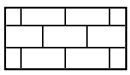

Sandstone


Siltstone

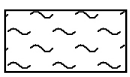

Laminite

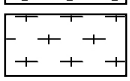

Mudstone, claystone, shale

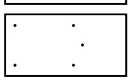

Coal


Limestone

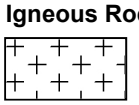
Metamorphic Rocks

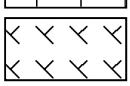

Slate, phyllite, schist

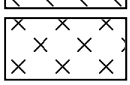

Gneiss

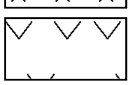

Quartzite

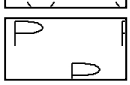
Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

TEST PIT LOG

CLIENT: Calibre Consulting (ACT) Pty Ltd
PROJECT: Ginnindery Residential Development
LOCATION: Strathnairn Stage 1

SURFACE LEVEL: 584.3 AHD
EASTING: 198741.84
NORTHING: 609432.36

PIT No: 14
PROJECT No: 77356.22
DATE: 12/9/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
584	0.1	FILLING-generally comprising loose, dry to moist, brown, fine to coarse grained gravelly sand							
		SILTY CLAY-hard, dry to moist, orange/red brown, low to medium plasticity silty clay with ironstone nodules and staining							
	0.8	SILTY CLAY-very stiff, moist, yellow/grey brown, high plasticity silty clay with trace coarse grained sand		D	0.9				
583	1	-from 1.5m, some rock like structure		D	1.8				1
	1.9	Pit discontinued at 1.9m -limit of investigation							
582	2								2

RIG: Kubota KX057-4 mini-excavator, 300mm bucket

LOGGED: SDG

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics | Environment | Groundwater

TEST PIT LOG

CLIENT: Calibre Consulting (ACT) Pty Ltd
PROJECT: Ginnindery Residential Development
LOCATION: Strathnairn Stage 1

SURFACE LEVEL: 584.4 AHD
EASTING: 198748.32
NORTHING: 609411.34

PIT No: 15
PROJECT No: 77356.22
DATE: 12/9/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
584	0.5	FILLING-generally comprising loose, dry to moist, brown, fine to coarse grained gravelly sand		D	0.2		pp >400		
	0.7	CLAY-hard, dry to moist, yellow brown, high plasticity clay with trace sand							
	1	GRANODIORITE-very low strength, extremely weathered, orange/brown, fine to coarse grained granodiorite -from 0.9m, moderately weathered		D	1.0				1
583	1.1	Pit discontinued at 1.1m -slow progress							
	2								2
582									

RIG: Kubota KX057-4 mini-excavator, 300mm bucket

LOGGED: SDG

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics | Environment | Groundwater

Foundation Maintenance and Footing Performance:
A Homeowner's Guide

CSIRO

BTF 18 replaces Information Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction
There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion
All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation
This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil
All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure
This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth
Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- **Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.**
- **Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.**

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation
Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

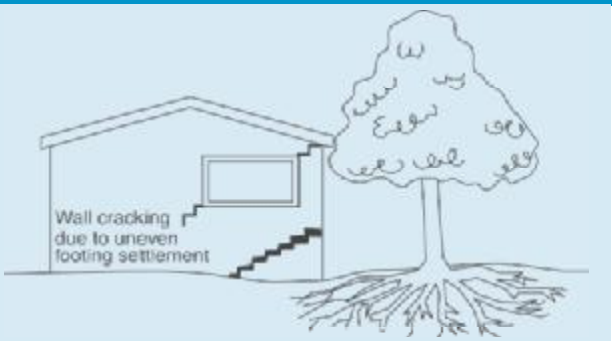
Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

Seasonal swelling/shrinkage in clay
Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

Trees can cause shrinkage and damage



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots
In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself
Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures
Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures
Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures
Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing
Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage
In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

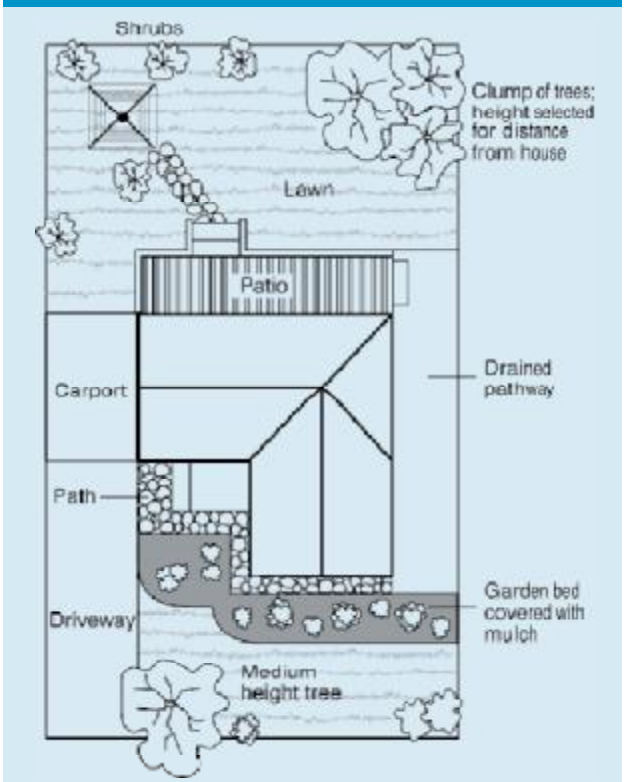
Protection of the building perimeter
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4

Gardens for a reactive site



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

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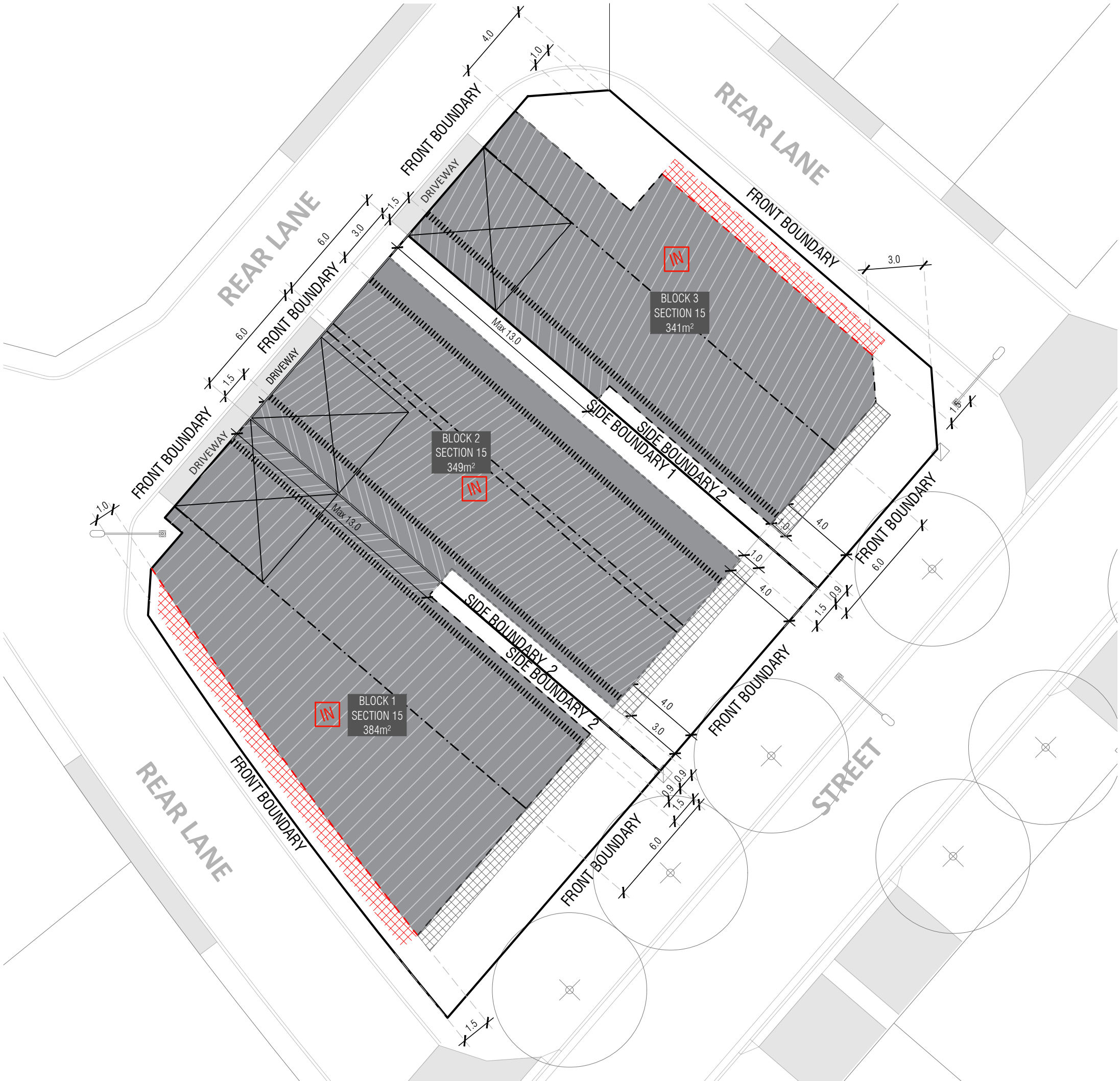
Appendix F



KEY MAP

LEGEND

- Block Boundary
- Garage Location
- BOUNDARY — Boundary Defined by SDHDC
- IN — Part of Integrated Development Parcel by SPC
  Refer to Figure 25

INDICATIVE BUILDING FOOTPRINTS
(based on min. building setbacks only)

- Lower Floor Level
- Upper Floor Level

MINIMUM BOUNDARY SETBACKS

- Strathnairn Precinct Code (SPC)
  refer to the SPC - Rule 1, Figure 5
- Single Dwelling Housing Development Code (SDHDC)
  front setbacks: refer to Rule 11, Table 3C
  side and rear setbacks: refer to Rule 12, Table 6B

- Upper Floor Level - Screened
- Upper Floor Level - Unscreened
- Articulation Elements (Articulation Zone)
  refer SDHDC Rule 11, Table 3C
- Articulation Elements (Articulation Zone)
  refer to the SPC - Rule 1, Figure 5
- 1.5m or nil setback to a max length of 13m
  refer to SDHDC Rule 12, Rule 15, Table 6B

BLOCK INFORMATION

STAGE	1A
ZONE	RZ3
SECTION	15
BLOCKS	1-3
CLASSIFICATION	MID SIZE
HOUSING TYPE	SINGLE DWELLING

REV	DRAWN	CHECKED	APPROVED	DATE
A	CS	JE	BR	10/09/19
B	CS	DZ	CS	15/08/22

DO NOT SCALE OFF DRAWINGS. DIMENSIONS ARE IN METRES.

INFORMATION ON THIS PLAN IS TO BE USED AS A GUIDE ONLY FOR THE DESIGN PROCESS. APPROVED EDP PLANNING CONTROLS NEED TO BE CHECKED AGAINST PRECINCT CODE UPLIFTS. PLANS TO BE READ IN CONJUNCTION WITH THE TERRITORY PLAN ALONG WITH BLOCK DISCLOSURE PLANS AND THE GINNINDERRY DESIGN REQUIREMENTS TO CONFIRM ALL CURRENT CONTROLS PERTAINING TO YOUR BLOCK.

SCALE
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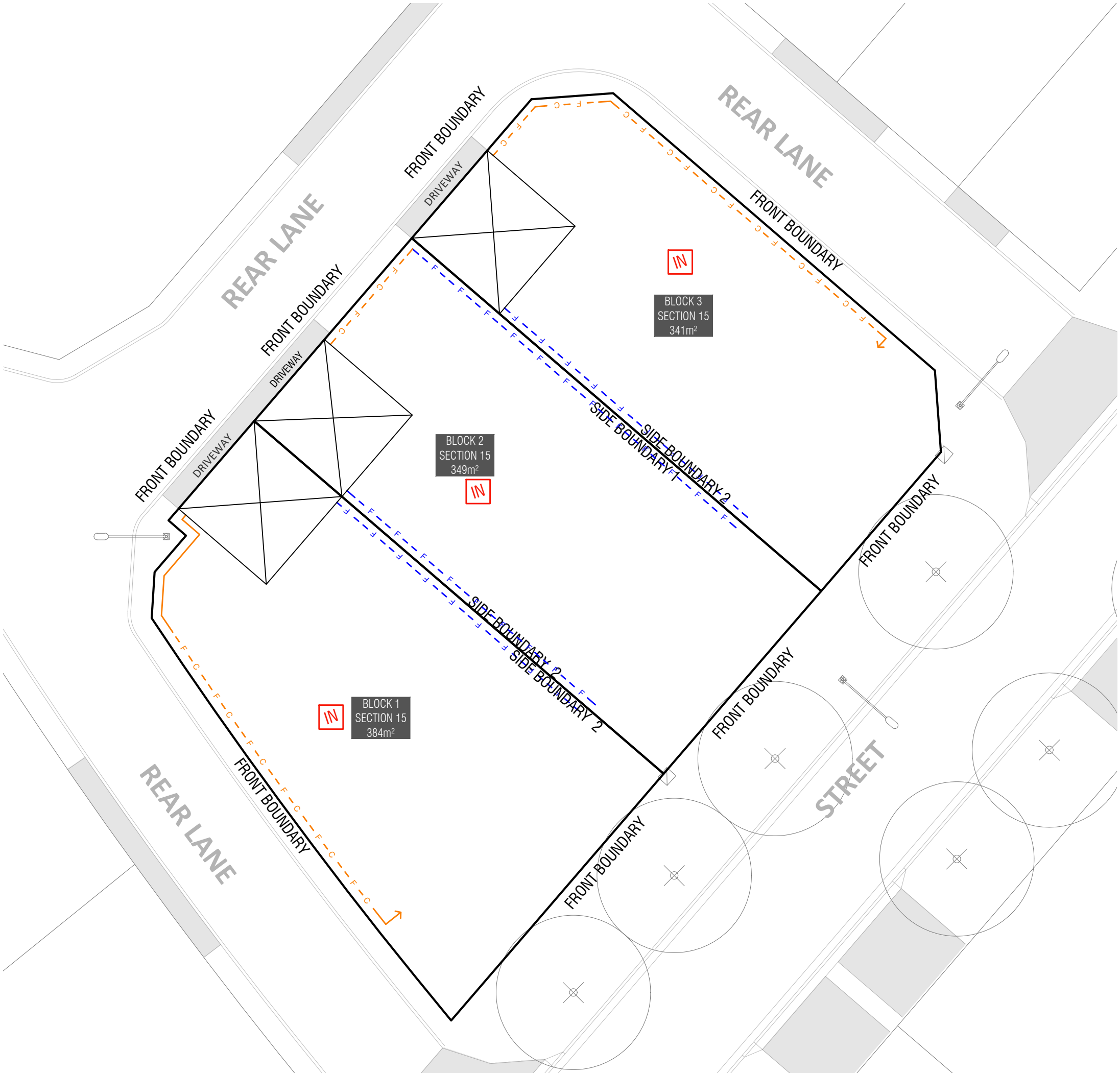
0 1 2 3 4 5 10

Ginninderry

BLOCK PLANNING CONTROLS
BUILDING & SITING CONTROLS PLAN



KEY MAP

LEGEND

Block Boundary

Garage Location

BOUNDARY FENCING

F

Side, Rear and Rear Lane Boundaries
Maximum height 1.8m from NGL| Minimum setback 0m (100%) | Min 1m behind the front building line

Construction and Finish
Inter-allotment fencing to be max 1.8m high timber paling fencing or lapped and capped timber paling fencing. If Colorbond is used, the profile must be Neetascreen or Miniscreen and colour "Basalt". Refer to Ginninderry Housing Design Requirements (Strathnairn)

F C

Front Fencing, Courtyard Walls and Laneways
Maximum height 1.8m | Minimum setback 0m (100%)
refer to SPC Rule 10, Table 1, Figure 3

Construction and Finish
Front Courtyard walls and fencing forward of the building line (where permitted) must be a combination of solid and semi-transparent elements that are constructed of the following:

- *masonry or stonework;*
- *dressed hardwood timber; or*
- *powder-coated aluminium.*
- *Openings to be a minimum of 10mm.*

refer to Fencing Control Plan and Ginninderry Design Requirements

Return Boundary Fencing to Building Line or Side Fence

BLOCK INFORMATION

STAGE	1A
ZONE	RZ3
SECTION	15
BLOCKS	1-3
CLASSIFICATION	MID SIZE
HOUSING TYPE	SINGLE DWELLING

REV	DRAWN	CHECKED	APPROVED	DATE
A	CS	JE	BR	10/09/19
B	CS	DZ	CS	17/08/22

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SCALE
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0 1 2 3 4 5 10

Ginninderry

BLOCK PLANNING CONTROLS
FENCING CONTROLS PLAN

Appendix G

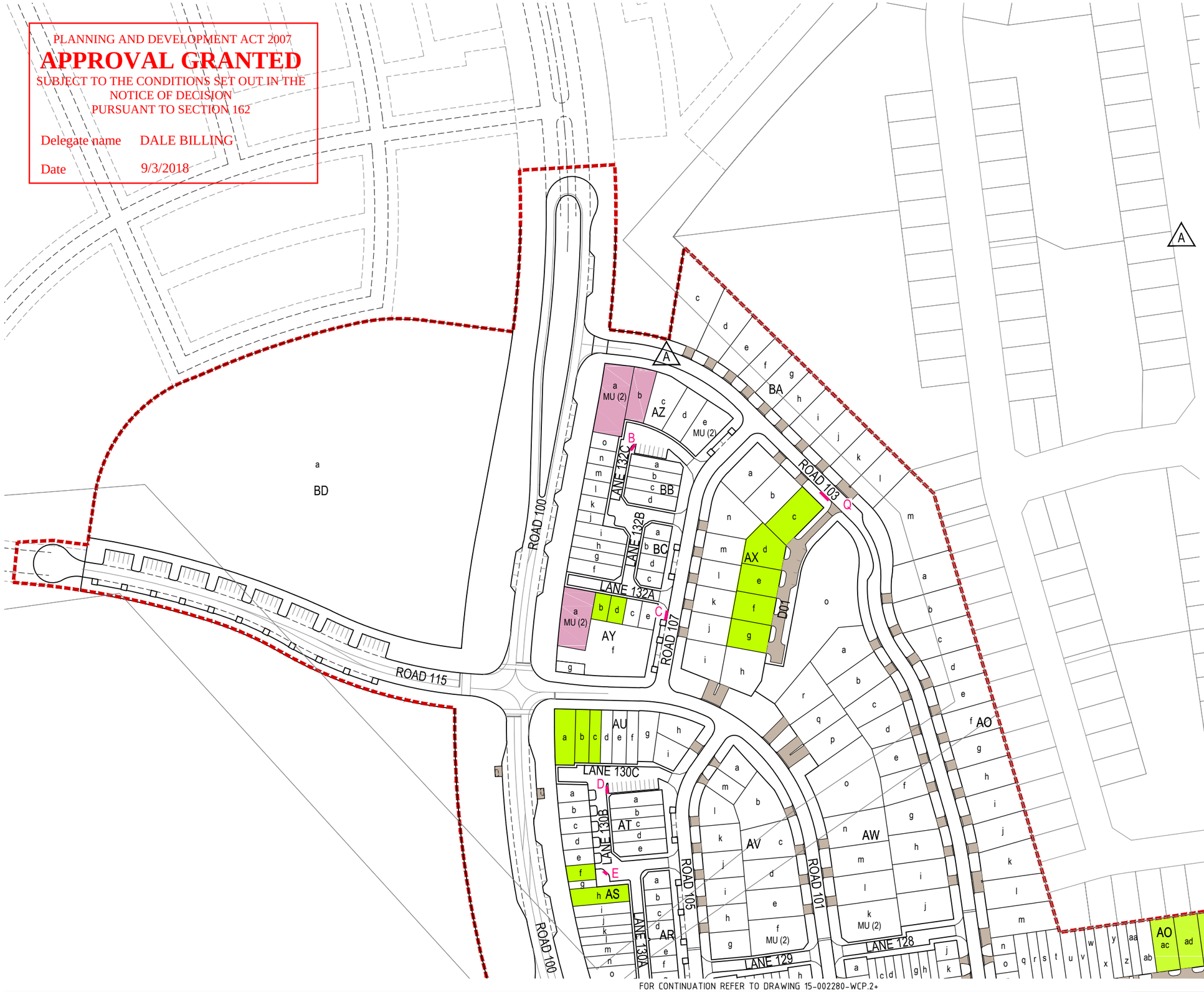
PLANNING AND DEVELOPMENT ACT 2007

APPROVAL GRANTED

SUBJECT TO THE CONDITIONS SET OUT IN THE NOTICE OF DECISION PURSUANT TO SECTION 162

Delegate name DALE BILLING

Date 9/3/2018

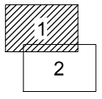


LEGEND:

- MULTI-UNIT SITES TO HAVE EXTERNAL NOMINATED WASTE COLLECTION POINTS
- MULTI-UNIT SITES TO HAVE INTERNAL ACCESS FOR WASTE COLLECTION
- SINGLE DWELLINGS WITH NOMINATED WASTE COLLECTION POINT
- STAGE 1 EDP BOUNDARY
- A — COMMON GARBAGE BIN COLLECTION POINT AND IDENTIFIER, REFER TABLE

N

COMMON COLLECTION POINT				
IDENTIFIER	BLOCKS SERVICED		NUMBER OF BLOCKS SERVICED	BIN ALLOCATION LENGTH (m)
	SECTION NUMBER	BLOCK NUMBER		
B	AZ	a, b	3	3.6
C	AY	a, b, c	4	4.8
D	AU	a, b, c	3	3.6
E	AS	f, h	2	2.4
G	AI	i, j, k	7	8.4
H	AE	e, f	8	9.6
	AF	a, b, c		
	AG	a		
I	AK	s, t, u, v, w	5	6.0
J	AO	ac,ad,ae,af,ag	5	6.0
K	AD	f, g	7	8.4
	AG	b, c, d, e		
L	AB	c	8	9.6
M	AA	h	2	2.4
N	BK	a, b	4	4.8
	BL	a, b		
P	BG	a	1	1.2
Q	AX	c, d, e, f, g	5	6.0
R	AO	b,l,m,n,o,p,q	7	8.4



KEY PLAN
NTS

NOTE:

1. ARRANGEMENTS ARE TO BE IN ACCORDANCE WITH 'DEVELOPMENT CONTROL CODE FOR BEST PRACTICE' IN WASTE MANAGEMENT IN THE ACT 2014.
2. GARBAGE COLLECTION FOR MULTI-UNIT SITES, COMMERCIAL SITE AND COMMUNITY FACILITY SHALL BE ON BLOCK.

FOR CONTINUATION REFER TO DRAWING 15-002280-WCP.2+

AMENDMENTS	FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
		SB	LA	CK	NB	14/06/2016	
A	A	SB	JK	CK	NB	23/09/2016	AMENDED TO SUIT REVISED LAYOUT

Knight Frank Town Planning
Knight Frank Town Planning ABN 95 159 090 294
RobertsDay planning·design·place
GROUPGSA
Cia landscapes + colour

WAE No.

PROJECT No.

A3 PLOT 1:2000 SCALE (METRES) 10 5 0 10 20 30 40 50 A1 PLOT 1:1000

CONSULT AUSTRALIA

CLIENT RIVERVIEW PROJECTS (ACT)

PROJECT WEST BELCONNEN STAGE 1 PLANNING

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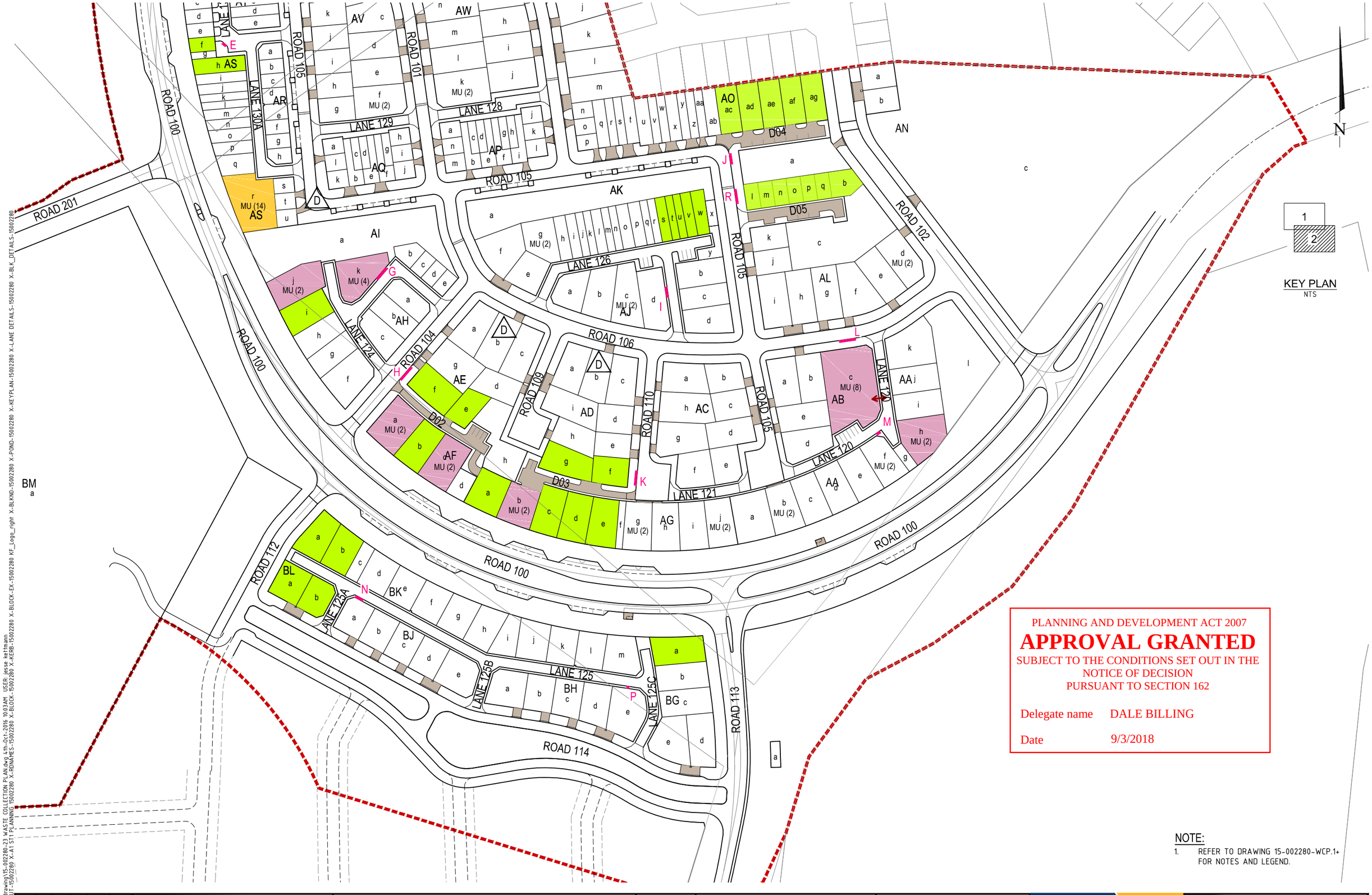
DRAWING TITLE
WASTE COLLECTION PLAN
SHEET 1 OF 2

DRAWING NUMBER 15-002280-WCP.1+ PLAN NO: 23.1

AMEND. A

FOR CONTINUATION REFER TO DRAWING 15-002280-WCP.1+



KEY PLAN
NTS

PLANNING AND DEVELOPMENT ACT 2007

APPROVAL GRANTED

SUBJECT TO THE CONDITIONS SET OUT IN THE NOTICE OF DECISION PURSUANT TO SECTION 162

Delegate name DALE BILLING

Date 9/3/2018

NOTE:

1. REFER TO DRAWING 15-002280-WCP.1+ FOR NOTES AND LEGEND.

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
A	SB	LA	CEL	MB	14/06/2016	
AMENDMENTS						
A	SB	JK	CEL	MB	23/09/2016	AMENDED TO SUIT REVISED LAYOUT
B	SB	JK	CEL	CEL	05/10/2016	STAGE BOUNDARY AMENDED
D	SB	JK	CEL	CEL	16/12/2016	DRIVEWAY AMENDMENTS

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PROJECT No.

A3 PLOT 1:2000 | SCALE (METRES) 10 5 0 10 20 30 40 50 | A1 PLOT 1:1000

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CLIENT RIVERVIEW PROJECTS (ACT)

PROJECT WEST BELCONNEN STAGE 1 PLANNING

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DRAWING TITLE WASTE COLLECTION PLAN SHEET 2

DRAWING NUMBER 15-002280-WCP.2+ PLAN NO: 23.2

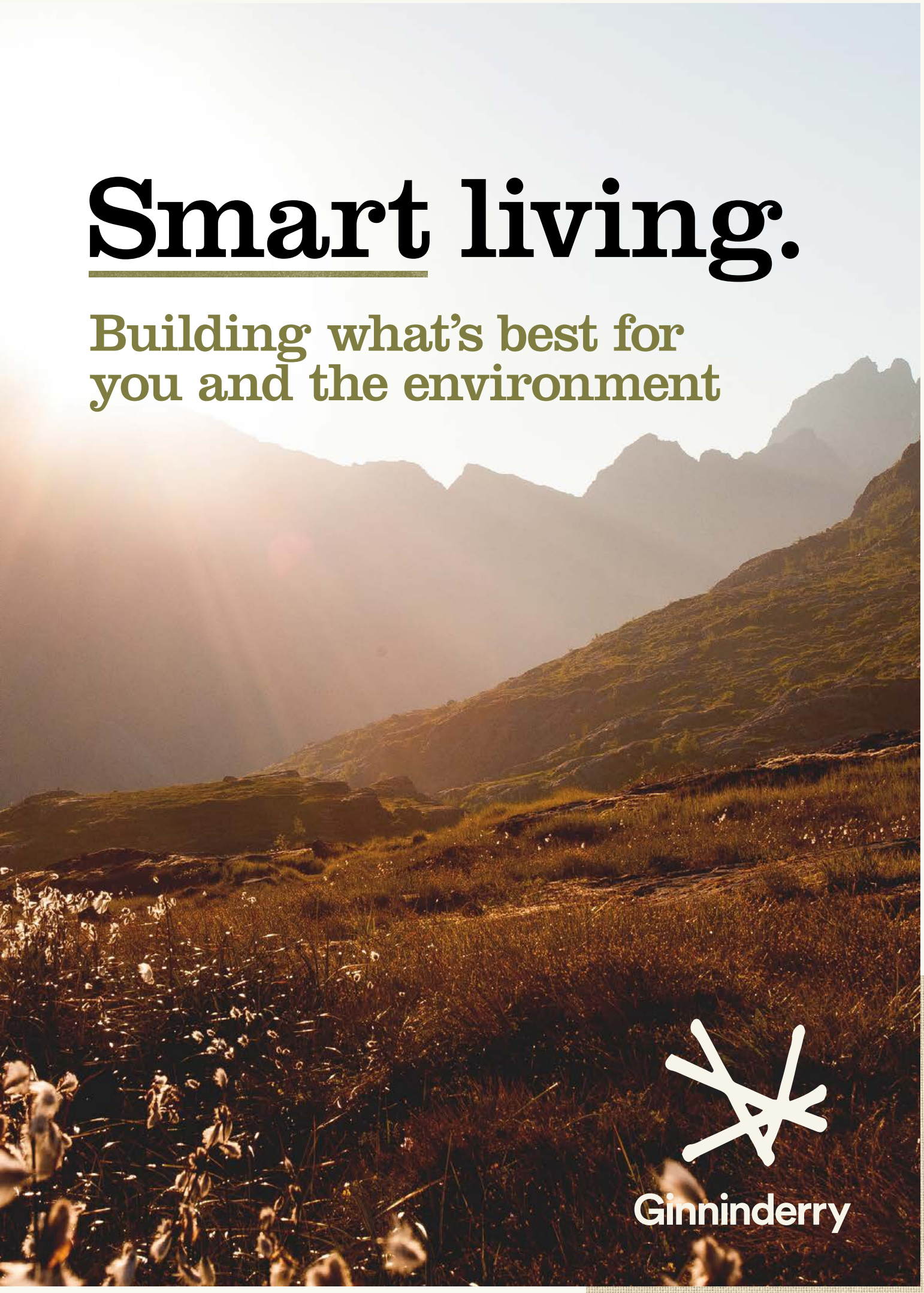
AMEND. D

FILE: H:\P15\15-002280\drawing\15-002280-23 WASTE COLLECTION PLAN.dwg 4th-Oct-2016 10:03AM USER: jesse.kettmann
Xrefs: X-SHEET LAYOUT-15002280 X-A1 ST1 PLANNING 15002280 X-BRNAMES-15002280 X-BLOCK-15002280 X-KERB-15002280 X-BLOCK-EX-15002280 X-BLK_DETAILS-15002280 X-LANE DETAILS-15002280 X-KEYPLAN-15002280 X-POND-15002280 X-BLKNOD-15002280 KF_Logo_right

Appendix H

Smart living.

Building what's best for you and the environment



Ginninderry

Building a new house is one of the most costly decisions you will make in your lifetime.

A new home – if built well – can last more than 100 years, so building it right the first time is important! The decisions you make around the size, orientation and materials can make a significant impact on the long term running costs of your home. At Ginninderry, our aim is to help you design a home that is more comfortable to live in, will provide a better lifestyle and will help you save on energy costs. Here we've put together some tips and guidelines to help you make the most of your investment.

Setting the Highest Standards

Ginninderry has achieved a World Leading 6 Star rating through the Green Building Council of Australia's Green Star – Communities program.

Ginninderry has been designed with best practice sustainability features front of mind. Now it's your turn!

Your house
Building the shell

Roof

Your roof plays an important part in orientating your solar panels. Your panels will work best if installed facing North at 30 degrees from horizontal. When designing your home, think about your roof design to easily cater for your panels. The more basic the design, the easier your job will be!

The colour of your roof could also affect how much heat your home absorbs. Pick lighter shades of roofing so yours doesn't have unwanted heat in your ceiling space.

Designing for the Canberra Climate

Canberra is a cool, temperate area of Australia. It has low humidity and large changes between day and night (diurnal) temperatures and four very distinct seasons. We have highly variable spring and autumn conditions, cold to very cold winters and hot, dry summers.

The variability of our climate will only become greater with climate change. Winter sun and summer shading will help to passively heat and cool your home when it needs it most.

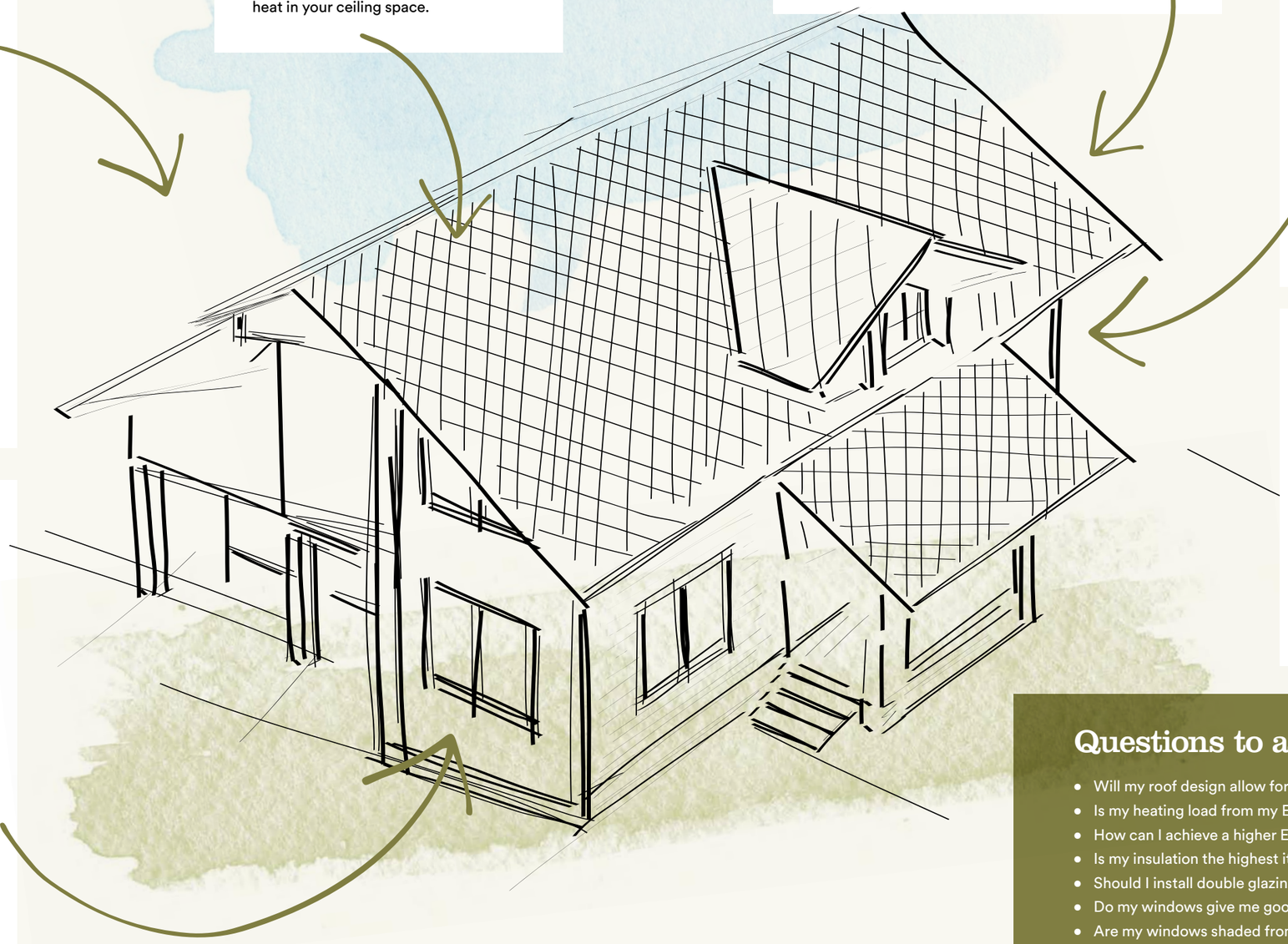
Energy Efficiency Rating

In the ACT, all new homes are required to meet a minimum 6 Star Energy Efficiency Rating (EER). The EER of your home assesses the building design, materials, and layout; and predicts how much heating and cooling you need to be comfortable. The overall EER is made up of both heating and cooling components. The heating load tells you how much heating is required to make your home comfortable. The cooling load tells you how much cooling you will require. The bigger the home, the more it takes to heat and cool your home and therefore affect your EER. The overall EER is a balance of both (like a see-saw) so make sure your EER is not weighted heavily to either heating or cooling. Or better still, ask how to achieve a higher EER!

Insulation and Draught Proofing

Controlling how air flows in and out of your home is important. The shell of your home should act like an esky – you want to seal and insulate it the best you can. Increasing the insulation in your ceilings and walls is one way to keep you warm in winter and cool in summer by giving you the greatest barrier between you and the external climate. This will not only help you save money on heating and cooling but will also stop air escaping unwillingly.

Consider having an air leakage test. A newly built house should achieve less than 10 air changes an hour.



Windows and Glazing

Windows and glass doors let in light, fresh air and provide good indoor and outdoor living connections. Windows are also the weakest link in the insulation of you building and can be a major source of unwanted heat gain in summer and significant heat loss in winter. Where possible, consider using double glazed, or low-e glass. The thermal performance of your windows also includes your frames. Aim for a window system with thermally broken frames, low U-values (less than 4.1) and high solar heat gain coefficient (around 0.66). A single glazed window can be up to 15 times worse at insulating your house than a wall. Choose the location of your windows carefully and size them appropriately.

Reduce Material Use

Think about a secure car port rather than a garage. While your car might need to be protected from the elements, you can create secure car ports that are cheaper than a fully bricked garage. Also consider future-proofing for electric vehicles by installing cabling in your garage or carport wall. This will save you time and money adapting in the future.

Questions to ask:

- Will my roof design allow for the PV panels I need?
- Is my heating load from my EER sensible for the Canberra climate?
- How can I achieve a higher EER?
- Is my insulation the highest it can be in my walls, floor, and roof?
- Should I install double glazing?
- Do my windows give me good air flow throughout my home?
- Are my windows shaded from the summer sun?
- Can I orientate my living areas to the North to make use of the sun in winter?

Your house
The inside

Generating, Managing & Storing Energy

Reducing the amount of energy you use is the most cost effective way to cut your energy costs.

Your PV panels and demand management system can help to provide renewable energy for you home.

Your demand management system (DMS) can help you monitor and manage your energy use. Air conditioner systems, heat pump hot water systems, lighting and security systems can also be managed by your DMS as long as the right appliances are selected.

Talk to your energy package provider about how appliances can be connected to your DMS.

Household Solar Battery systems can also store the power you generate with your PV system, letting you use the power when the sun isn't shining. Remember to consider the location of your battery – either now or allocating space for it in the future. It may need to be on an external wall or within a fire rated enclosure.

Indoor Air Quality

The paints, sealants and glues used in your home can sometimes be quite toxic. Look for materials with low or no Volatile Organic Compounds (VOCs). Removing VOCs from your home will result in a fresher, healthier home environment.

Designing for Accessibility

Designing for accessibility is about thinking about how your house caters for a range of mobility and health levels and how these needs can change over time.

Accessibility is important for:

Families with young children – making it easier to manoeuvre prams and strollers and removing trip hazards for toddlers

People with temporary injuries – larger doorways and step-free entries make it easier for people in wheelchair and crutches.

Ageing population – for both residents and elderly visitors, family and friends

People with a disability and their families – not only in their own homes but for visiting others.

Lighting

Think about using natural light from windows before using artificial light. Installing energy efficient LED lighting will save you money over time. Reduce the number of downlights you install in your home. If you really need them, make sure they are fully sealed, LED downlights which can allow insulation around them. Traditional downlights act as big holes in your ceiling – making your insulation less effective.

Indoor Drying Space

Canberra winters are cold but we get really lovely sunny days. Consider space inside for your washing that gets good winter sun. This will reduce the need for a dryer.

Reduce Materials

The less materials required to build your home, the cheaper it will be. Consider using polished concrete floors, exposed brick (rather than adding a render) and other material which don't require further finishes where sensible

Bike Storage

Active living is an important part of Ginninderry. Make sure you allocate a space for your bikes. Make them easy to access so you're more likely to use them.

Zoning

Think about the areas of your home that you use and when you use them. By zoning your home, you can have better control of which areas you want to heat and when. The smaller the area you are heating at any one time, the cheaper your bills will be.

Efficient Appliances

Many new appliances come with Energy Rating Labels. The more stars an appliances has, the less energy it will use. Choose appliances not only by their price tag but also by how much they will cost you to run every day!

Saving Water

Using rain water to flush your toilets and wash your clothes (as well as for your garden) can help you save money on your water bill.

Installing water efficient fixtures and fittings will also help you save water.

Make Recycling Easy

Designing separate waste bins into your kitchen will make it easier on bin day! Design for composting, recycling and general waste.

Heating and Cooling

The cheapest way to heat your home is with the sun. To make the most of it, your house should allow for lots of winter sun and keep out the harsh summer sun. Place rooms that you're likely to spend daylight hours in (typically your living rooms) to the north of your block. This will allow you to get good winter sunlight and reduce the hot summer sun.

Use thermal mass to store the sun's heat and provide night time warmth in cold conditions. This can be achieved with tiled or polished concrete floors in north facing living areas. This allows the sun to heat the area inside and contribute to a naturally cool home in summer.

Cross Ventilation

Your doors and windows can help cool your home on summer nights by allowing air to travel through your home. Install flyscreens to your openable windows and doors so that you can securely open your windows and doors.

Questions to ask:

- Is my home zoned in a way that I can heat and cool different areas separately?
- Is there good ventilation throughout the house?
- Has my heating and cooling system been designed to take into account my EER rating?
- Can I use no or low VOC products in building my home?
- Can my demand management system be connected to other appliances like my air conditioner?
- Have I allocated space for bikes?

Your house Landscape

Choose a garden you can maintain

Not everyone has a green thumb. Pick a garden design that suits your lifestyle. If you forget to water your plants, pick drought tolerant, hardy natives or woody herbs like rosemary that don't require a lot of attention.

Free Water

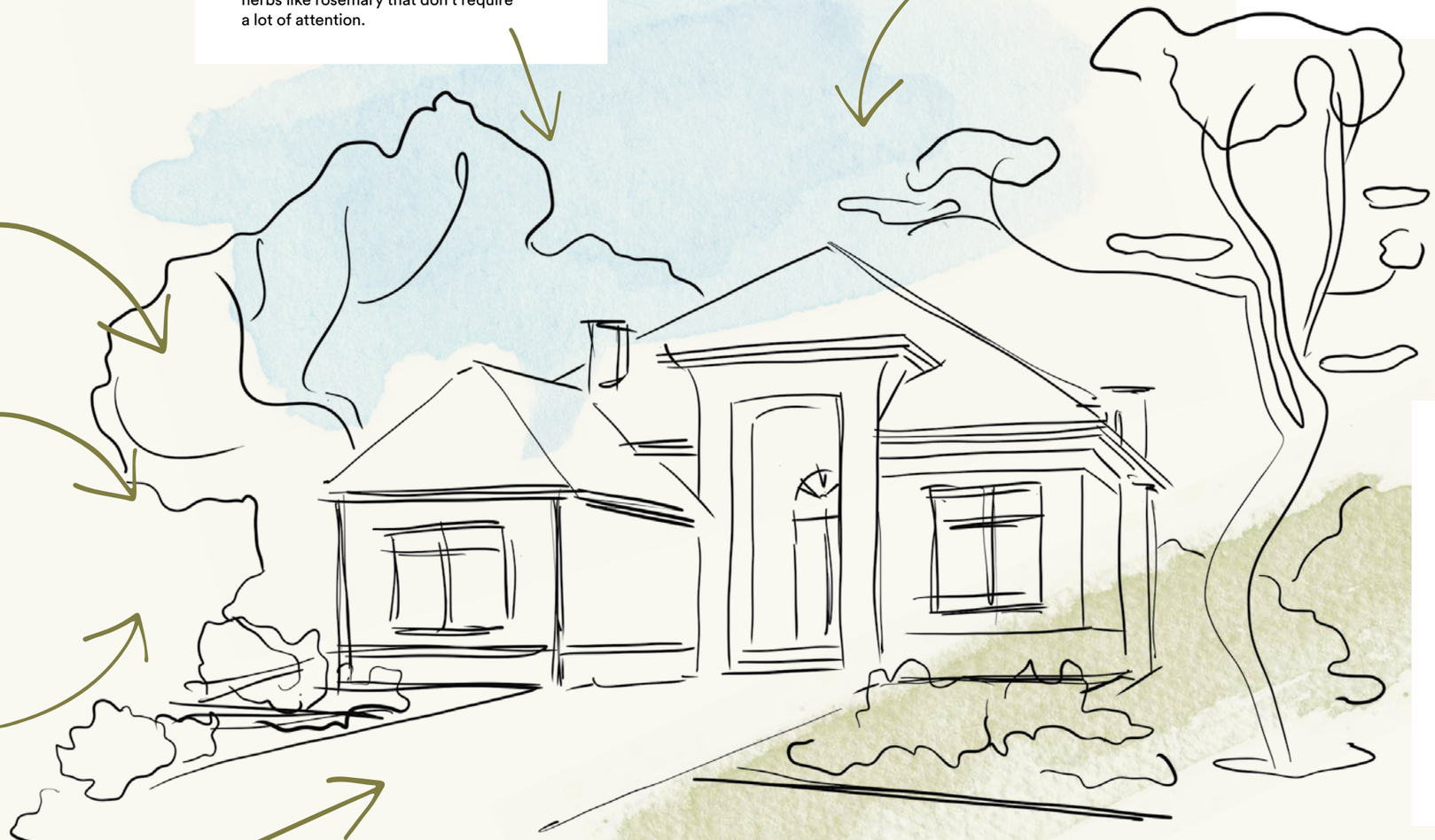
Most homes in Ginninderry have a rain water tank. Rain water is great for watering your plants.

Green Shading

Plants do a great job of shading East and West facing windows. Use them to keep you cool in summer. Choose plants that can be pruned back in winter (or that are deciduous) so that you can let in the winter sun.

Make your plants useful plantings

Whether you plant edible foods or plants that attract bees (or other pollinators and wildlife), your garden can not only look pretty but also have a higher purpose.



Space for Bins

The ACT Government is currently trialling green bins for garden waste. To futureproof for a potential ACT-wide rollout, allocate space for three bins:

- General waste (red lid)
- Mixed Recycling (yellow lid)
- Green waste (green lid)

Conserving our Conservation Corridor

The plants that you plant in your yard will impact our conservation corridor. Bins and other animals will spread seeds through our landscape. It is therefore very important that we don't plant species that are considered weeds (easily spreading) or sleeper weeds (plants that could become weeds in the future or in other climate conditions).

Clothes Drying

Allocate an outdoor drying space that has good access to winter sun. This is usually on the northern side of your home. Using the sun to dry your clothes is a lot cheaper than a dryer!

Soft space vs Hard space

The more concrete or hard surfaces in your yard, the hotter your house will be in summer. Think about how you can use grasses, plantings or permeable pavers to limit the amount of hard spaces you have.

This will help you save money by reducing your energy and water required to keep your home cool.

Compost

Use your kitchens scraps as compost for your yard or get a worm garden. Don't have room? Donate your scraps to the Community Garden!

This will help reduce unnecessary waste going to landfill.

Questions to ask:

- How can I reduce the amount concrete and hard spaces in my yard?
- Can I use alternatives like permeable paving, groundcovers or mulch?
- Have I allowed enough space for my bins?
- Have I checked that my plants won't become weeds in the conservation corridor?
- Are my plants edible or good for birds, bees and other pollinators?
- Is my garden drought and frost tolerant?
- Have I made the most of my rain water tank?

Mandatory Requirements:

Check the Ginninderry Housing Development Requirements

More Info:

FACTSHEETS

Ginninderry Front Garden Landscape Concept Designs

Ginninderry Energy Package Factsheet

Are your garden plants going bush? ACT Government Parks and Conservation Service

WEBSITES

YourHome – Australia's guide to environmentally sustainable homes www.yourhome.gov.au

Josh's House – showcasing the benefits of sustainable housing to the community through demonstration and inspiration www.joshshouse.com.au

Scinergy – the science of energy efficiency www.scinergy.com.au/airleakage

Water Efficient Labelling and Standards (WELS) Scheme www.waterrating.gov.au

Energy Rating – the more stars the more savings www.energyrating.gov.au

National House Energy Rating Scheme (NATHERS) www.nathers.gov.au

Livable Housing Australia www.livablehousingaustralia.org.au

BOOKS

The Energy-Freedom Home: how to wipe out electricity and gas bills in nine steps. Beyond Zero Emissions (2015)

The CSIRO home energy saving handbook: how to save energy, save money and reduce your carbon footprint. John Wright, Peter Osman Peta Ashworth (2009)

Got More Questions?

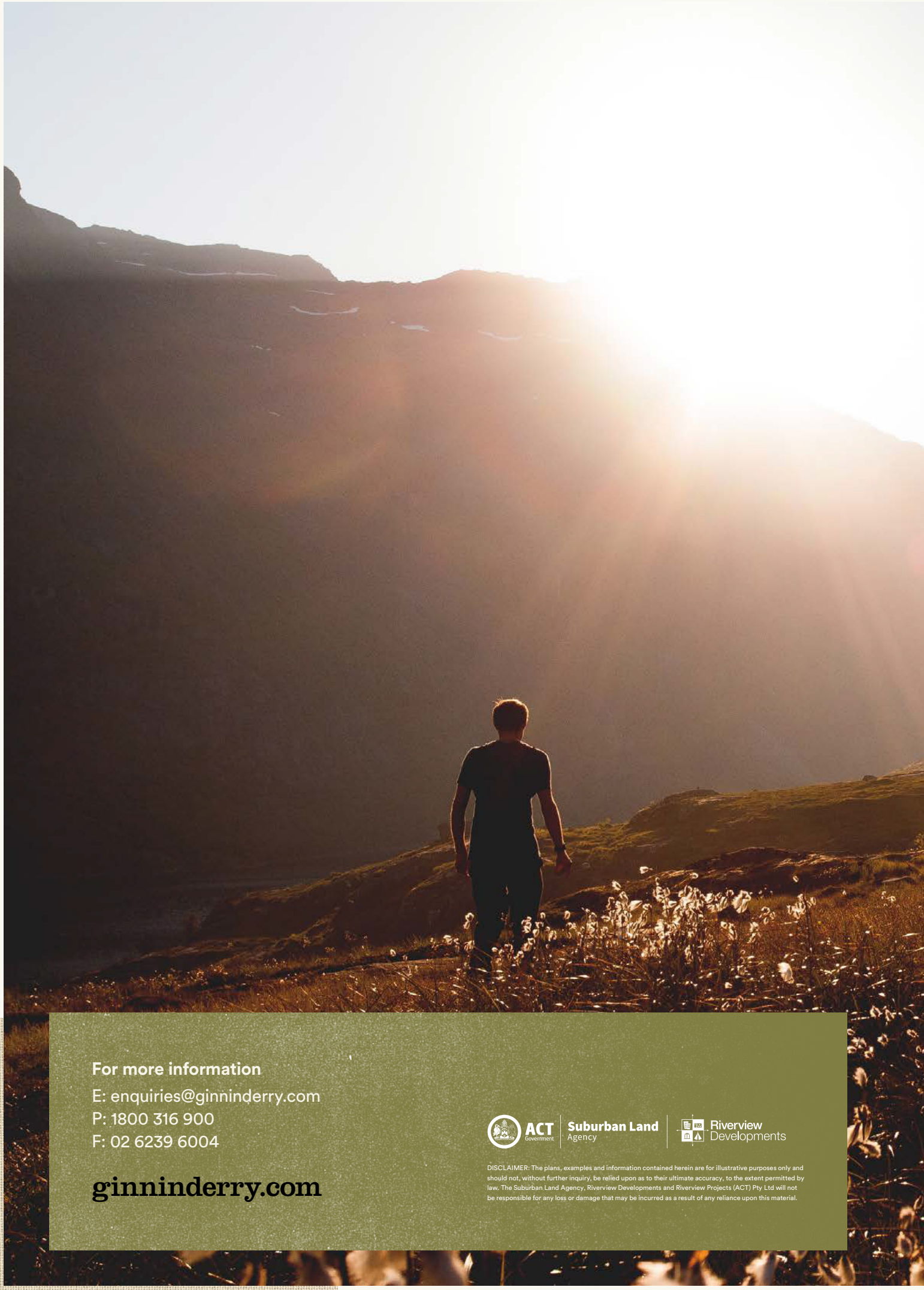
Contact Ginninderry and ask to speak to our Design Co-ordinator or Sustainability Manager:

enquiries@ginninderry.com

ginninderry.com

Phone 1800 316 900

Fax 02 6239 6004



For more information

E: enquiries@ginninderry.com
P: 1800 316 900
F: 02 6239 6004

ginninderry.com

ACT Government | Suburban Land Agency | Riverview Developments

Strathnairn Housing Development Requirements Application Form

Ginninderry Housing Development Requirements Application Form

Ginninderry

Property details

Block	
Section	
Block size	
Suburb	

Purchaser details

Name	
Phone	
Mobile	
Email	

Architect/designer details

Name	
Company	
Phone	
Mobile	
Email	

Builder details

Name	
Company	
Phone	
Mobile	
Email	

Required documents

☐ **1. 1:200 site plan with the following details:**

- Overall building envelope with setback dimensions
- Extent of any retaining walls
- Location and size of Principal Private Open Space (PPOS)
- Location and clearance of all easements
- Services locations such as electrical and NBN meter boxes, water and gas meter, water tank, condenser units, HWS, clothes line
- Finished floor levels for the house and garage as well as gradient of driveway
- Extent of driveway and location of letterbox

☐ **2. Provide a fencing plan show all precinct code fencing requirements.**

- Include location of letter box incorporated in wall on as a masonry pier.

☐ **3. 1:200 erosion sediment controls plan.**

☐ **4. 1:100 floor plan and roof plan(s) with dimensions and size of dwelling area.**

☐ **5. 1:100 elevations with the following details:**

- Natural and proposed ground level with proposed FFL from boundary to boundary
- Extent of cut and/or fill and any retaining walls, including details of the height and materials
- Roof pitch

☐ **6. Energy efficiency rating certificate for the dwelling.**

☐ **8. Water fixture list.**

Contact us:
E: designs@ginninderry.com
P: 1800 316 900 **M:** Charlotte 0411 844 645 (Tuesday to Thursday)

Ginninderry is a joint venture between the Suburban Land Agency and Riverview Developments, with Riverview Projects (ACT) Pty Ltd ABN 30 165 870 539 acting as development manager. Correct as at 26/10/2020

Ginninderry Housing Development Requirements

Ginninderry

	Minimum requirements	Record for your home
Star rating as shown on your energy efficiency rating certificate	6 Star	☐ Certificate Provided
Solar PV array size (kW)	**Block size <250m²:** 2kW **Block size 251m2 < 350m²:** 3kW **Block size 351m2 < 500m²:** 4kW **Block size > 500m²:** 5kW	Panel Array Size:
Home energy management system	Reposit Power, Combined Energy and Evergen home energy management systems have been pre-approved. If an alternative system is installed, please provide a copy of a signed Alternative Home Energy System Assessment.	Brand:
Inverter	Inverter compatible with an approved home energy management system above.	Brand: Model:
Hot water system	Solar or Heat Pump Systems Only Temperature range to -5°C.	Brand: Model:

Ginninderry Housing Development Requirements

Ginninderry

	Minimum requirements	Record for your home
Heating and cooling systems Please select: ☐ Reverse cycle air conditioning ☐ Air conditioning – cooling only ☐ Ducted evaporative cooling ☐ Ground source heat pump ☐ Other (please specify)	**Cooling Cycle:** **EER** >= 3 **SPL** < 57 **Temp. Range** -5°C to 43°C **Heating Cycle:** **COP** >= 3.5 **SPL** < 57 **Temp. Range** -10°C to 15°C EER = Energy Efficiency Ratio | SPL = Sound Pressure Level of outdoor unit measured at 1m. Why is this important? Read more here | COP = Coefficient of Performance	Brand: Model: EER: SPL: Temp Range: COP: SPL: Temp Range:
Water fixtures and fittings	Showerheads 3 star (< 9L/min) Tapware 4 star Toilets 4 star	☐ All fixtures comply ☐ Fixture List Provided
Rain water tank	**Block Size <250m²:** N/A **Block Size 251m² < 350m2:** 2,000L **Block Size 351m² < 600m2:** 4,000L **Block Size 601m² < 800m2:** 8,000L **Block Size > 800m²:** 10,000L	Tank Size: ☐ Connected to Laundry, toilets and all external taps

External colours and finishes schedule (Please tick the boxes below)

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Roof Tiles – Monier

Atura

- ☐ Babylon
- ☐ Barramundi
- ☐ Caraway
- ☐ Mist Grey
- ☐ Saltspray
- ☐ Seashell
- ☐ Silver Pearch
- ☐ Wildrice
- ☐ Wollemi
- ☐ Aniseed

Horizon

- ☐ Babylon
- ☐ Barramundi
- ☐ Camelot
- ☐ Caraway
- ☐ Mist Grey
- ☐ Saltspray
- ☐ Seashell
- ☐ Silver Perch
- ☐ Wildrice
- ☐ Wollemi
- ☐ Aniseed

Roof Tiles – Boral

Artline

- ☐ Earth
- ☐ Fossil
- ☐ Basalt
- ☐ Night Quartz
- ☐ Eclipse
- ☐ Asphalt

Wave

- ☐ Earth
- ☐ Fossil
- ☐ Basalt
- ☐ Night Quartz
- ☐ Eclipse
- ☐ Asphalt

Vogue

- ☐ Shale
- ☐ Gunmetal
- ☐ Charcoal Grey
- ☐ Stonewall
- ☐ Taupe

Contour

- ☐ Quartz
- ☐ Taupe
- ☐ Walnut
- ☐ Shale
- ☐ Gunmetal
- ☐ Peat
- ☐ Charcoal Grey

Striata

- ☐ Gunmetal
- ☐ Taupe
- ☐ Walnut
- ☐ Charcoal Grey

Slimline

- ☐ Gunmetal
- ☐ Stonewall
- ☐ Taupe

Roof Tiles – Bristile

Prestige

- ☐ Lithium
- ☐ Palladium
- ☐ Titanium
- ☐ Mercury
- ☐ Tungsten

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Roof Tiles – Bristile (cont.)

Classic

- Pearl
- Sand
- Steel
- Pebble
- Mica
- Savannah
- Bark
- Gun Metal

Metal Roof – Colorbond

Contemporary Colours

- Basalt
- Cove
- Dune
- Evening Haze
- Gully
- Ironstone
- Jasper
- Mangrove
- Shale Grey
- Surfmist
- Wallaby
- Windspray
- Monument

Classic Colours

- Classic Cream
- Deep Ocean
- Pale Eucalypt
- Paperbark
- Woodland Grey

Matt Colours

- Basalt
- Dune
- Shale Grey
- Surfmist

Fence Colour

Side and Rear Boundary Fencing

- Basalt

Window Frame Colour

Contemporary Colours

- Basalt
- Cove
- Dune
- Evening Haze
- Gully
- Monument
- Jasper
- Mangrove
- Shale Grey
- Surfmist
- Wallaby
- Windspray

Standard Colours

- Natural Pearl

Selected Pearls

- Ultra Silver
- Precious Silver
- Silver Medalist

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Bricks – Austral

Ultra Smooth	☐ Tempo	☐ Chill	☐ Jazz	☐ Rhythm
La Paloma	☐ Miro	☐ Azul		
Urban One	☐ Silver	☐ Latte	☐ Chiffon	☐ Pepper

Wilderness Design

☐ Grey Gum ☐ Silver Birch ☐ Blue Gum ☐ Blackberry ☐ Blackbutt
☐ Rosewood

Everyday Life

☐ Engage ☐ Freedom ☐ Leisure ☐ Stimulate ☐ Unwind
☐ Escape

Whitsunday Range

☐ Brampton ☐ Orpheus

Metropolis

☐ Alabaster ☐ Marcasite ☐ Topaz

San Selmo Smoked

☐ Grey Cashmere (feature only or arch merit) ☐ Cloudy Silver (feature only or arch merit) ☐ Opaque Slate (feature only or arch merit) ☐ Wild Storm (feature only or arch merit)

Metallix

☐ Quartz ☐ Platinum ☐ Titanium ☐ Cuprum ☐ Bronze
☐ Gun Metal Blue

Bricks – PGH

Alfresco	☐ Vino	☐ Chocolatto	☐ Truffle	☐ Cocoa
	☐ Espresso			
Altitude	☐ Olympus	☐ Apollo	☐ Matterhorn	
Academy	☐ Quantum	☐ Alumni	☐ Oscar	☐ Nobel
	☐ Juilliard			
	☐ Quantum	☐ Alumni	☐ Oscar	☐ Nobel
	☐ Juilliard			
Composite	☐ Pebble	☐ Aluminium	☐ Urban Blue	☐ Charcoal
Dry Pressed Architectural	☐ Hawkesbury Bronze	☐ Livingston Gold	☐ Mowbray Blue	☐ Macarthur Mix
	☐ Balmerino Blend	☐ Tinto Cream	☐ Red Rum	☐ Silver Shadow
	☐ Black Beauty			

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Bricks – PGH (cont.)

Dark and Stormy	☐ Monsoon	☐ Thunder	☐ Whirlwind	☐ Zephyr
Foundations	☐ Gravel	☐ Stone		
Highlands	☐ Blackheath	☐ Leura (feature only)		
Manhattan	☐ Chelsea (feature only or arch merit)	☐ East Hampton (feature only or arch merit)	☐ Tribeca (feature only or arch merit)	
Metallic	☐ Nickel Flash	☐ Pewter	☐ Blue Steel Flash	
Morada	☐ Blanco	☐ Ceniza	☐ Nero (feature only)	☐ Gris
Opaline	☐ Tourmaline	☐ Garnet	☐ Tiger Eye	
Palazzo	☐ Sorbetto			
Pure Linens	☐ Cinders & Soot	☐ Flannel Grey	☐ Pebble Creek	☐ Whispering White
Smooth	☐ Harvest Cream	☐ Cashmere	☐ Cream	☐ Pearl Grey
	☐ Mineral	☐ Volcanic	☐ Rustic Harvest Cream	☐ Copper Glow
	☐ Black & Tan	☐ Brown	☐ Choc Tan	☐ Terracota
Foundations	☐ Granite	☐ Red		
Urban Essence	☐ Melbourne Blue (feature only)	☐ Storm (feature only)		
Velour	☐ Crevole	☐ Cream	☐ Pearl Grey	☐ Red
	☐ Brown	☐ Choc Tan	☐ Mineral	☐ Volcanic
	☐ Terracota	☐ Granite		

Additional colour and finishes information

Driveway finish colour:

Retaining wall material finish and colour:

Courtyard wall material and finish:

Feature materials or colours:

Rendered wall colours:

Light weight cladding:

Fencing along street frontage:

Side gate & fencing parallel to street frontage:

Ginninderry

ANNEXURE E - DIRECTOR'S GUARANTEE

I/we, the Director/s of _____ [insert Buyer], agree as follows:

1. In consideration of the Seller entering into this Contract at my/our request, I/we agree to guarantee to the Seller:

   1.1.1 the performance and observance by the Buyer of all its obligations under this Contract, before, on and after Completion of this Contract; and

   1.1.2 the payment of all money payable to the Seller or to third parties under this Contract or otherwise.

2. This is a continuing guarantee and binds me/us notwithstanding:

   2.1.1 my/our subsequent death, bankruptcy or liquidation or the subsequent death, bankruptcy or liquidation of any one or more of the Buyer or the Buyer's Guarantor;

   2.1.2 any indulgence, waiver or extension of time by the Seller to the Buyer or to me/us or to the Buyer's Guarantor; and

   2.1.3 Completion of this Contract.

3. In the event of any breach by the Buyer covered by this guarantee, including in the payment of any money payable to the Seller or to third parties under this Contract or otherwise, the Seller may proceed to recover the amount claimed as a debt or as damages from me/us without having instituted legal proceedings against the Buyer or any other of the Buyer's Guarantor and without first exhausting the Seller's remedies against the Buyer.

4. I /we agree to keep the Seller indemnified against any liability, loss, damage or claim due to the default of the Buyer which the Seller may incur in respect of this Contract.

Dated this day of 2020

Signed, sealed and delivered in the presence of:

_____
Signature of witness

_____
Full name of witness

_____
Signature of Guarantor

_____
Full name of Guarantor

_____
Address of Guarantor

Signed, sealed and delivered in the presence of:

_____
Signature of witness

_____
Full name of witness

_____
Signature of Guarantor

_____
Full name of Guarantor

_____
Address of Guarantor