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# BUILDING STANDARDS WORKSHOP No. 1





# outline

- CMS/Building Standards
- Building Standards categories
- NEV Rating Tool (Scoresheet)
- Building Approval Pathway
- Submitting a Design for Approval
- Construction
- Worked example
- Practice session
- Feedback & Review



# CMS/Building Standards

- Community Management Statement
- Clauses 42, 43 & 44 of CMS
- Annexure 3 Building Standards
- Building Review Panel
- NEV Sustainable Design Appraisers
- Appeals Process
- Stage 1 & timeframe

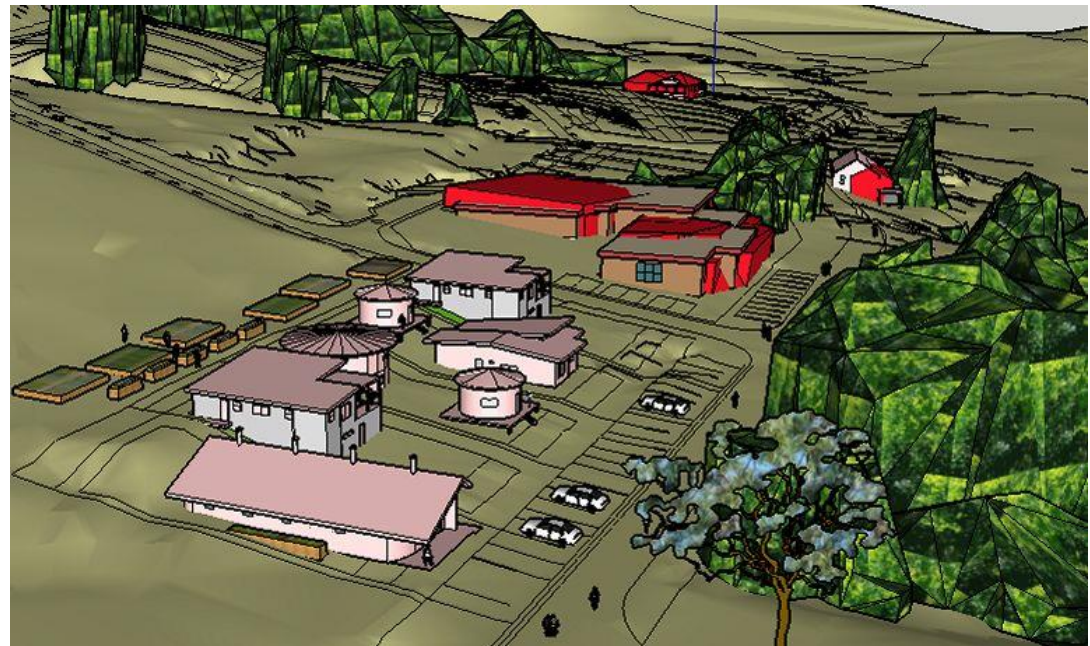


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# Site & Neighbourhood Analysis

Neighbourhood Agreement covering :-

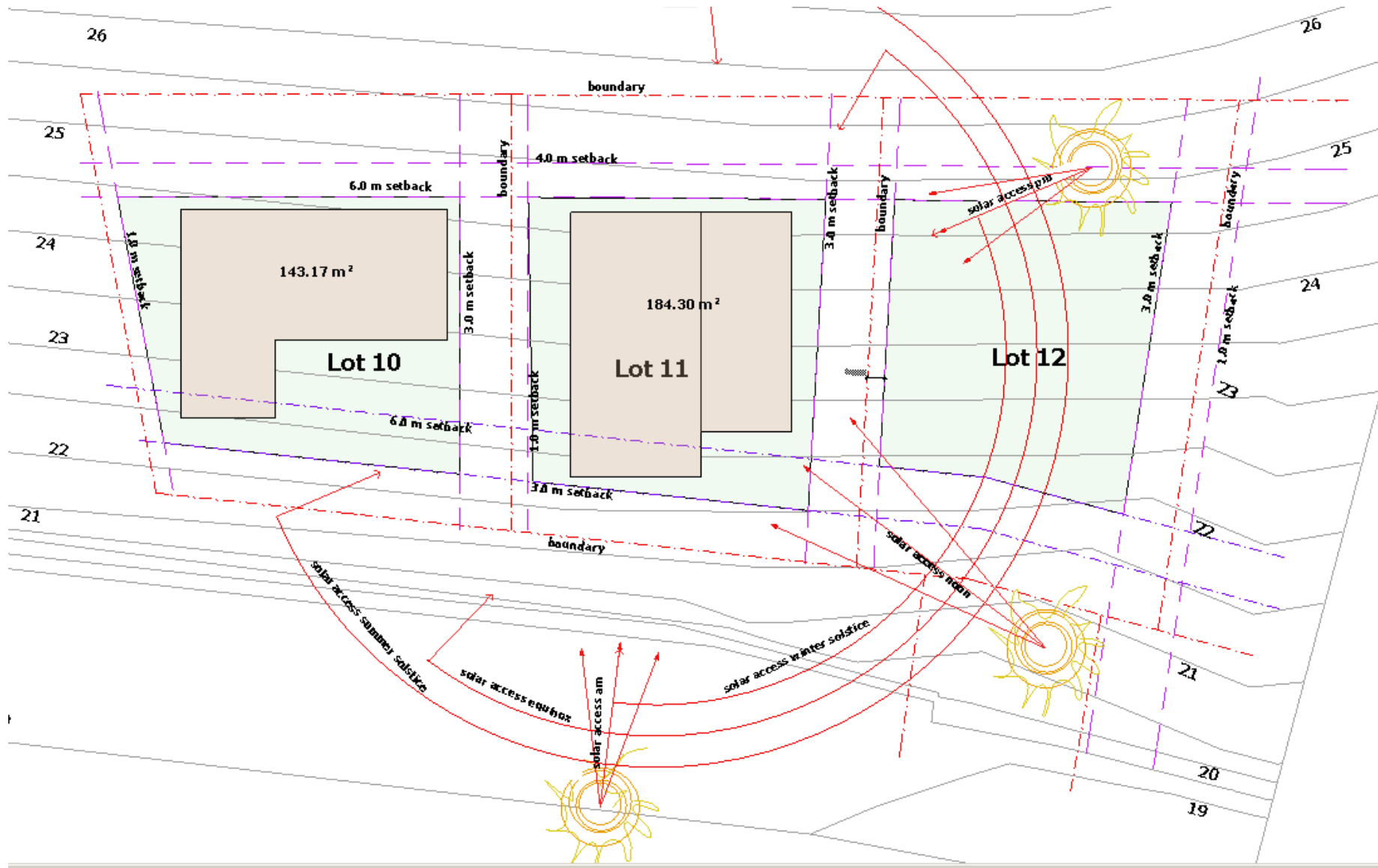
- Solar Access
- Hill Thallis and Council setbacks and controls,
- Common Gardens
- Building Height and Volume





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# Site & Neighbourhood Analysis

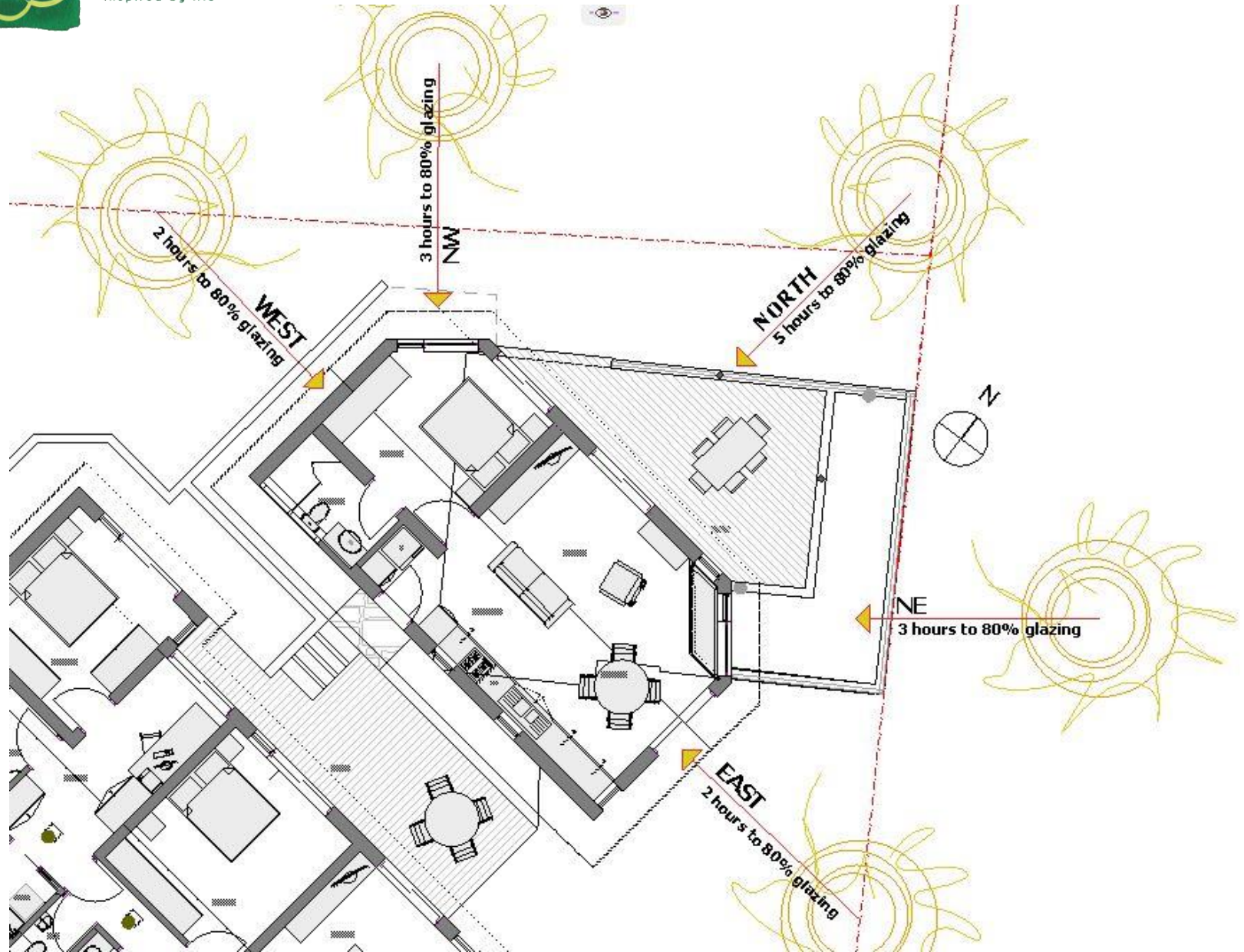






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# Solar Access





# Building Standards Categories

- BASIX - [www.planningportal.nsw.gov.au/planning-tools/basix](http://www.planningportal.nsw.gov.au/planning-tools/basix)
- water
- energy
- materials
- waste
- indoor environment
- other
- innovation





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# NEV Rating Tool (Scoresheet)

- 70% min. above BASIX score
- Mandatory Items
  - Pass in BASIX
  - Min. 7 stars NatHERS thermal comfort rating
  - Renewable Energy – to meet annual demand
- Weightings and Points
- Help
- No of Bedrooms







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# Water

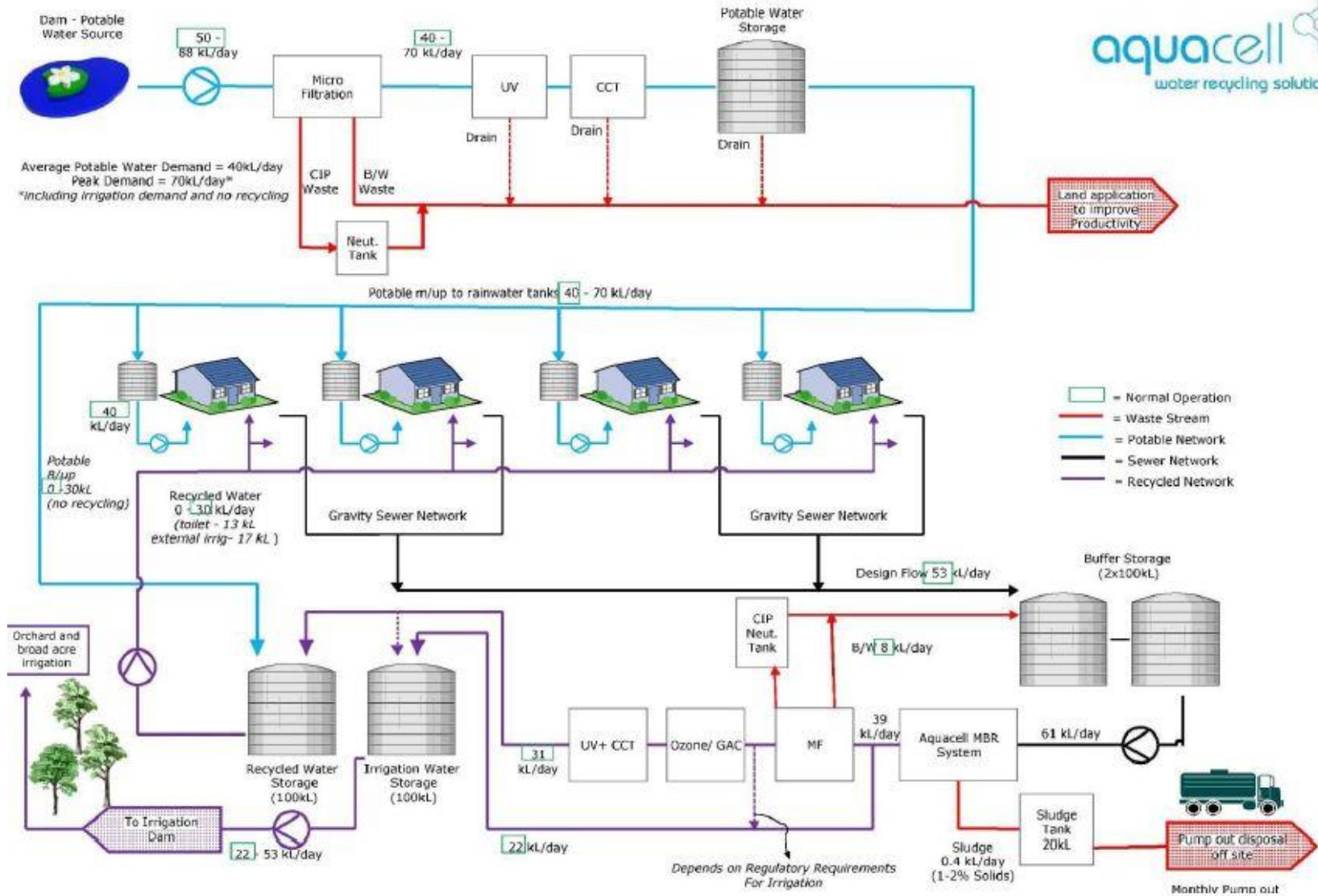
- Potable water supply from NEV dam
- NEV recycled waste water system
- BASIX assessment
- Landscaping – irrigation demand
- Fixtures and fittings – WELS ratings
- Rainwater tanks
- Stormwater /Water Sensitive Urban Design (WSUD)





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# NEV Water Cycle





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# BASIX Water

- Landscape area – native endemic or low water use plants

<http://www.sydneywater.com.au/SW/your-home/saving-water-at-home/garden-and-pool/plant-selector/index.htm>

- Fixtures and fittings – WELS ratings

<http://www.waterrating.gov.au/>





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# BASIX Water

- Rainwater tanks

- First flush diverters
- Only can connect to garden or outside use
- leaf exclusion guttering recommended
- Preferable to have low maintenance, quiet pump system ideally with a controller (not requiring pumping of pressure vessel) with a solenoid diverter (Rainbank or sim)



- NEV Recycled Water System

- Will be available as an option within BASIX
- Can select for use to connect to toilets or water garden





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# Energy

- Reducing greenhouse gas emissions through :-
  - Building thermal performance
  - Use of energy efficient devices
- Renewable Energy generated
- Peak power load management

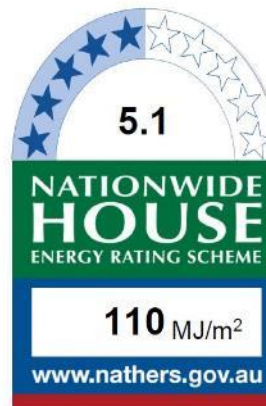






# Energy – thermal comfort

- NatHERS rating – min.7 star rating
- Mandatory requirement
- Accredited NatHERS assessor required



Certificate no.: 0000664854  
Assessor Name: Graham Hunt  
Accreditation no.: 20127  
Certificate date: 24 Aug 2016  
Dwelling Address:  
7 St. Mirren Avenue  
Kellyville, NSW  
2155

[www.nathers.gov.au](http://www.nathers.gov.au)





# Energy – thermal comfort

- **NatHERS**– Federal government – [www.nathers.gov.au](http://www.nathers.gov.au)
- **Accredited assessor** - ABSA  
<http://www.absa.net.au/accreditation/find-an-assessor>  
or BDAV - <http://bdav.org.au/find>
- **Brief assessor properly** - not just compliance but min. 7 stars
- **Checklist** – all materials, colours, windows, floor finishes, fans, lights
- **Designer** – involve early in the process
- **Final Certification**
- **Later revisions**



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# Energy – thermal comfort building factors

- Orientation/site factors
- Zoning/volume
- Insulation
- Thermal mass
- Windows
- Shading
- Ventilation/Infiltration

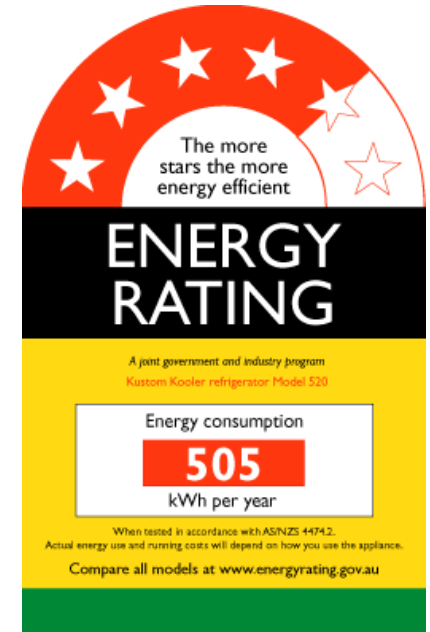




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# Energy Efficient Devices

- Hot Water system
  - solar or heat pump
- Heating and cooling devices
- Energy rating of appliances





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# Renewable Energy

- 'To at least meet annual demand' - mandatory
- At least 2 kW for the first bedroom and 1kW for each additional bedroom
- Extra points if more kW than minimum required is installed
- Optimise orientation and pitch
- Check for overshadowing
- NEV Smart Grid compatible







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# Peak Load Management

- Fixed standby switches or timers
- Smart metering with occupant control or energy monitoring system
- Remote control system
- Smart Grid switch-off on high demand
- Hot Water on timer
- Battery storage system





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# Materials

- Embodied energy of materials
- Renewable or natural materials
- Recycled material
- Durability
- Low toxic impact
- Transport energy
- End of life/adaptability





# Embodied Energy

## Thermal mass v. lightweight

<b>Embodied Carbon of the whole house by area (TonnesCO<sub>2</sub>) but not including the mandatory PV</b>									
Source	Bill Lawsons "Building materials; energy and the environment", the source in "Your Home"								
	<b>Floor Area (Sq M)</b>	<b>40.0</b>	<b>60.0</b>	<b>79.8</b>	<b>100.0</b>	<b>119.5</b>	<b>140.0</b>	<b>160.0</b>	<b>179.7</b>
		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
Lightweight I	<i>1</i>	13.4	18.2	23.0	23.9	28.3	33.1	37.7	42.3
Lightweight II	<i>2</i>	15.1	20.3	25.6	27.5	32.4	37.5	42.6	47.5
Lightweight III	<i>3</i>	15.8	21.6	27.3	29.1	34.4	40.1	45.6	51.1
Strawbale I	<i>4</i>	17.1	22.6	27.9	28.2	33.1	38.3	43.3	48.2
Strawbale II	<i>5</i>	19.0	25.5	31.7	31.7	37.6	43.7	49.7	55.6
Mudbrick I	<i>6</i>	19.1	25.2	31.2	35.6	41.1	47.0	52.7	58.3
Mudbrick II	<i>7</i>	20.6	27.4	34.2	38.3	44.4	51.1	57.5	63.8
Reverse Brick	<i>8</i>	21.2	27.9	34.8	35.3	41.4	48.1	54.5	60.9
Organic I	<i>9</i>	18.2	23.8	29.3	37.0	41.9	47.2	52.3	57.4
Organic II	<i>10</i>	17.8	23.0	28.3	36.2	40.8	45.8	50.8	55.6
Steel frame and clac	<i>11</i>	23.1	30.5	37.9	42.5	49.2	56.4	63.5	70.4
Double brick	<i>12</i>	32.4	41.2	49.8	61.4	68.9	76.9	84.8	92.5
Probable number of bedrooms		1	1	2	2	3	4	4	4





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# Renewable & Natural Materials

- Rammed Earth
- Mud brick
- Straw bale
- Hempcrete
- Timber
- Stone





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# Recycled Materials

- Timber – framing, flooring, cladding
- Roof tiles
- Steel reinforcement
- Recycled content
- Composite materials
- Doors and windows
- Fixtures and fittings
- Paving



Composite wood and plastic decking material  
Source : <http://www.modwood.com.au>



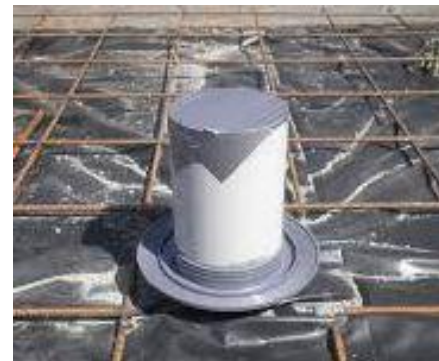




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# Durability

- Warranty on materials
- Hard wearing options
- Detail design
- Exposure conditions
- Non-chemical termite barrier
- Access for maintenance
- Ease of replacement





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# Low Toxic Impact

- Using low toxic materials
- Avoiding the use of PVC
- Alternative piping materials
- Naturally durable timber rather than treated
- Paints and sealants from natural products
- Using natural renewable products



Pipe alternatives – HDPE & ABS  
Source : <http://www.philmac.com.au>





# Transport Energy

- Using local products and suppliers
- Using local contractors
- Number and length of site deliveries
- Avoiding imported materials
- Using products fabricated or assembled locally





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# End of Life/Adaptability

- Design allows for future changes
- Materials can be easily disassembled and recycled
- Mechanical fixing rather than adhesives
- Ease of replacement of equipment







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# Waste

- Domestic resource recovery
  - Worm farm
  - Compost bin
  - Internal bins or other storage for waste sorting
- Construction resource recovery
  - Construction waste reuse and recycling
  - Amount of waste and destination
  - Keeping records
  - Design to suit product size
  - Packaging minimisation





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# Indoor Environment Quality

- Day lighting
  - Cross ventilation
  - use of low VOC paints
  - use of low formaldehyde joinery and panel materials
- 
- avoidance of dust trapping materials such as carpets, fabrics, high shelves etc
  - noise abatement through the use of insulation (external as well as internal)
  - breathable construction



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## Other

- Universal access for occupants
- Can house be adapted for future uses
- Livable Housing Guidelines
- ability to withstand severe external forces
  - bushfire
  - storms
  - flood





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# Bonus Points

- Innovation
  - earth ships
  - phase change materials
  - alternative energy sources
  - new materials or equipment
- Food production
- Open design presentation





# NEV Rating Tool

No.	Category	Sub-category	Goal	Criteria	WEIGHTING POINTS (%)	Enter your value here	Units	YOUR SCORE	Instruction	Further help (Links to appropriate section of user guide)
					Number of bedrooms =			3	Please enter the number of bedrooms including studios	
					Your progressive score without bonuses is =			82		
1	WATER	Potable water usage	Reduce drinking water use	Water efficient devices Water effective landscaping	15	34	BASIX points	16	Create a BASIX file and enter the data progressively until you reach the Fixtures tab under the Water. Complete your selection for fixtures on this page and then hit the 'Calculate' button. Enter the Basix Water score at this point into the Scoresheet before proceeding to the next tab	<a href="#">Fixtures</a>
2		Other Basix water items	Water conservation, re-cycle and re-use	40% water score in BASIX Mandatory Stormwater & greywater management Rainwater tanks Swimming pools	4	60	BASIX points	6	A pass in Basix is a mandatory requirement for this scoresheet. It is essential to have a minimum of 40 Basix points to pass Basix. Enter the Basix result after pressing 'Calculate' on the ALTERNATIVE WATER tab. The score depends on the difference between this line and line 1.	<a href="#">Alternative Water</a>
3		Water efficient appliances	Washing machines & dishwashers are not included in Basix		1	No		1	Enter:- * 0.5 points if using a washing machine with WELS rating of 4 stars or better * 0.5 points if using a dishwasher with WELS rating of 4 stars or better	
		<b>Sub-Total</b> All water items	Sub-total for lines 1 to 3 =	<b>20</b>			Sub-total	<b>23</b>		
4	ENERGY	Building Thermal Performance*	Decrease Energy consumption	Mandatory	15	7	NATHERS Stars	15	A minimum of 7-stars is a mandatory requirement for this scoresheet. Enter your NATHERS assessor's NATHERS star rating.	<a href="#">Star Rating</a>
5		Energy Efficient devices	To increase energy efficiency		5	10	NEV points	5	Enter:- * 2 points if using a reverse cycle air conditioning set of 3.5 stars or better, 1 point if 2.5 stars or better. * 1 point if you will NOT be installing an active climate system, 1 point if you will be installing ceiling fans in bedrooms and living rooms * 2 points if using a fridge/freezer of 3.5 stars or better, 1 point if 2.5 stars or better * 1 point if using a dishwasher of 4 stars or better or not having one at all, 1 point if 3.5 stars or better * 1 point if using a clothes washer of 4 stars or better or not having one at all, 1 point if 3.5 stars or better * 2 points if using a clothes dryer of 4 stars or better or not having one at all, 1 point if 2.5	<a href="#">Line 5</a>
		<b>Sub-Total</b> All energy	Sub-total for lines 4 to 5 =	<b>20</b>			Sub-total	<b>20</b>		
6		Renewal Energy	Photovoltaic panels	Mandatory Provide at least 2 kW for the first bedroom and 1kW for each additional bedroom	5	4.0	kW	5.0	A special case exists for 4 bedroom houses where 4.5 kWp is permissible otherwise a 3-phase electrical connection and inverter would apply.  The expectation cell calculates the required power which is at least 2.0 Kw for the first bedroom and an additional 1.0 Kw for each additional bedroom.	<a href="#">Renewable Energy</a>
7				PV set larger than required	3	0.0	kW	0.0	Enter the surplus over and above the minimum requirement of the "2 plus 1" rule. The yield is 1 point per additional Kw up to 3 Kw, thereafter it is only half a point.	<a href="#">Additional PV</a>
8		Peak Power Demand	Reduce summer and winter peak load	Fixed standby switches or timers. Energy monitoring system. Remote control system. Smart metering. SmartGrid switch-off on high demand. Battery storage system	7	3	NEV points	3.0	Enter:- * 1 point if smart meter installed has occupant interface or can connect to energy monitoring system * 1 point if having a Smart phone app to remotely control peak demand and can link to fixed appliances installed. * 1 point if permitting switch-off on high demand. * 1 point if fixed stand-by switches or timers on critical appliances are installed * 3 points if installing a battery system * 2 points if installing a battery system within 5 years of obtaining approval	<a href="#">Peak Energy</a>
		<b>Sub-Total</b> All energy	Sub-total for lines 6 to 8 =	<b>35</b>			Sub-total	<b>28</b>		



# Approval Process

## NEV Building Approval Pathway



**Lot Owner**

*Negotiate a:*

- **Neighbourhood Statement of Agreement** with your neighbours. We recommend bringing your Architect or Designer along to these discussions.

*When the agreement is signed:*

- **put it into your Dropbox folder** and notify the BRP by email

**Lot Owner**

**Design your House**

*Finish the DA documentation including:*

- **Statement of Environmental Effects**
- **Basix Certificate**
- **NatHERS Certificate** (your SDA will assist with these certificates)
- **NEV Scoresheet**
- **Development Application**

*When finalised:*

- put all these documents into your **Dropbox folder** and notify BRP by email.
- apply for the NEV **Design Confirmation Certificate**

**Lot Owner**

Once you have your NEV **Design Confirmation Certificate:**

- put the **Development Application** to Council for Development Consent

**Lot Owner**

Once you've got **Development Consent** from Council:

- Obtain a **Construction Certificate** (fr CCC or a private certifier)
- Lodge a Builder's Bond with NEV CA
- Lodge your builder's details, including licence & insurance.
- Build your house!
- Apply to council for your **Occupancy Certificate**

**Lot Owner**

- Forward your **Occupancy Certificate** to BRP
- Continue to monitor energy usage with the help of our Smart Grid, and water usage with help from NEV Power.

**BRP**

*Provides you with:*

- Your SDA who will assist you all the way through this process.
- Your own Dropbox folder
- Neighbourhood agreement Template
- A 'Gateway 1' letter of consent

**BRP**

*Provides you with:*

Templates for :

- Statement of Environmental Effect
- Application approval form
- Owners consent form
- Cut & Fill plan
- Standard building specifications
- Landscape plan
- Schedule of external finishes
- Lighting & Ventilation strategy
- Shadow diagram
- Site survey with tree schedule
- Water & Sewerage plan

Your SDA will show you how to get the Basix & NatHERS certifications.

**BRP**

*Provides you with:*

NEV **Design Confirmation Certificate**

**BRP**

*Provides you with:*

- 'Gateway 4' letter, outlining requirements for truck movements on site
- reminder of building requirements

**BRP**

*Provides you with:*

- A community party

**Definitions**  
BRP: Building Review Panel  
SDA: sustainable Design Appraiser  
CA: NEV Community Association  
CCC: central coast council



# Approval Documents

## Council DA Application documents

- Owners and CMS approval
- Statement of Environmental Effects
- Survey Plan
- Site Plan/Site Analysis
- Character Statement
- BASIX Certificate
- Floor Plans, Elevations & Sections
- Schedule of External Finishes
- Extent of Cut and Fill Plan
- Landscape Plan
- Waste Management Plan
- Stormwater Management Plan
- Erosion & Sediment Control Plan
- Bushfire Report
- Shadow Diagrams (two storey only)
- Water & Sewer Plan

## NEV BRP Panel documents

- Neighbourhood agreement
- Shadow diagrams (all houses)
- NatHERS Certificate
- Access statement
- NEV Rating Tool Assessment
- Energy Efficiency Assessment  
(for items not covered under BASIX)
- Building material design statement
- Indoor Environment Quality statement
- Innovation Strategy statement  
(if opted for)

## Prior to Construction/Construction Certificate

- Builder's details
- Structural engineering details
- Construction Management Plan



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# Construction

- Briefing builder on NEV Building Standards
- Construction Management Plan
- NEV Security bond
- OH & S – site induction
- Sediment & Erosion Control
- NEV Sustainable Design Appraisers
- Recycling Centre
- Bulk buying/sharing resources
- Share on social media

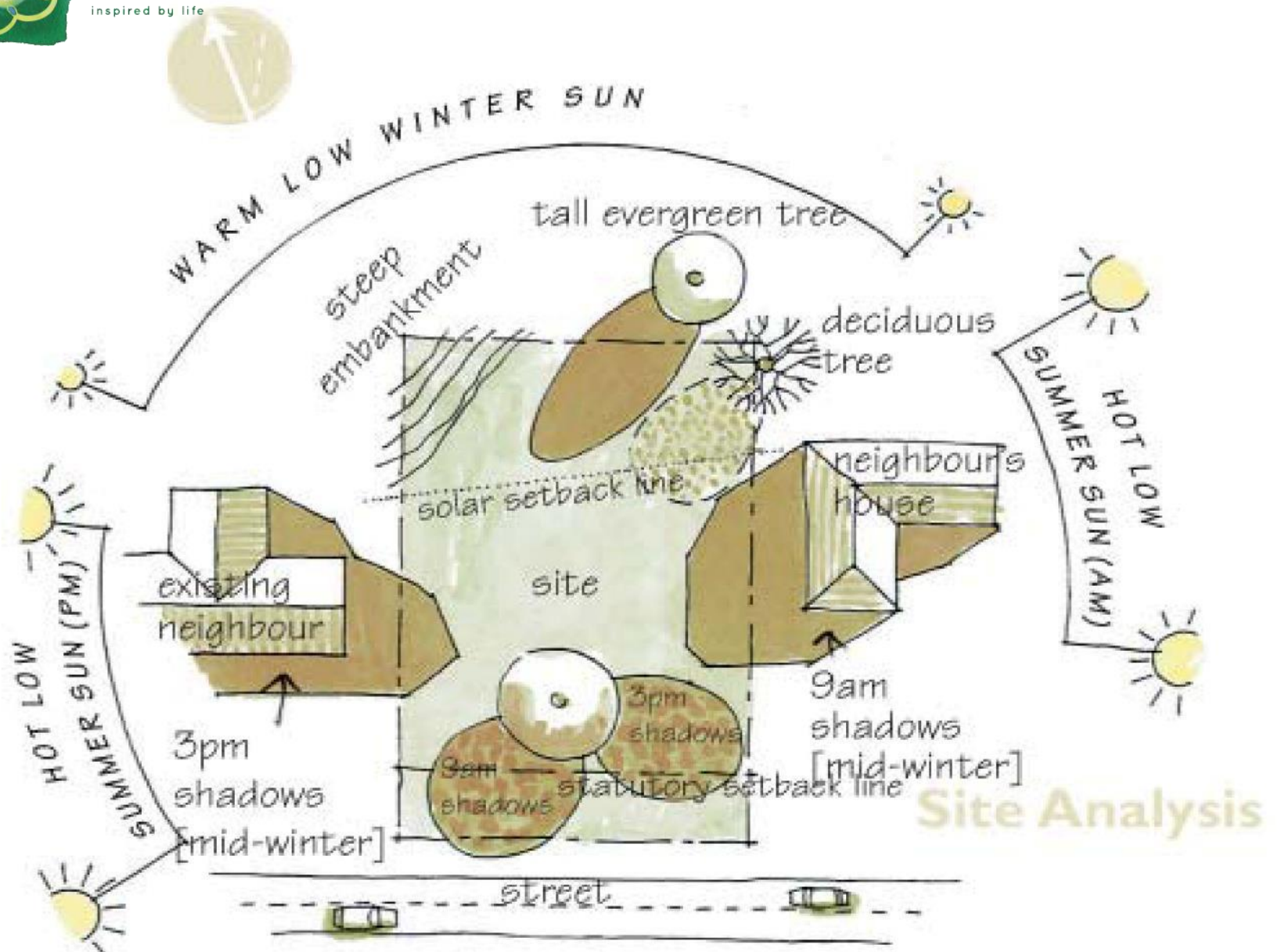






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# Site Analysis



Site Analysis



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# Statement of Environmental Effects

- Template provided
- Must address the issues of each individual site
- Relevant Gosford LEP 2013 & DCP 2014 provisions
- Identify where proposal is outside provisions
- Include Character Statement
- Address privacy, views and overshadowing
- High environmental performance



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# BASIX Certificate

## BASIX<sup>®</sup> Certificate

Building Sustainability Index [www.basix.nsw.gov.au](http://www.basix.nsw.gov.au)

### Multi Dwelling

Certificate number: 712627M

This certificate confirms that the proposed development will meet the NSW government's requirements for sustainability, if it is built in accordance with the commitments set out below. Terms used in this certificate, or in the commitments, have the meaning given by the document entitled "BASIX Definitions" dated 18/09/2014 published by the Department. This document is available at [www.basix.nsw.gov.au](http://www.basix.nsw.gov.au)

Secretary

Date of issue: Friday, 24 June 2016

To be valid, this certificate must be lodged within 3 months of the date of issue.



Planning &  
Environment

Project summary		
Project name	N10 Narara Cluster Hosuing	
Street address	25 Research Road Narara 2250	
Local Government Area	Gosford City Council	
Plan type and plan number	deposited 1126998	
Lot no.	13	
Section no.	-	
No. of residential flat buildings	0	
No. of units in residential flat buildings	0	
No. of multi-dwelling houses	18	
No. of single dwelling houses	0	
Project score		
Water	✔ 63	Target 40
Thermal Comfort	✔ Pass	Target Pass
Energy	✔ 99	Target 40

### Certificate Prepared by

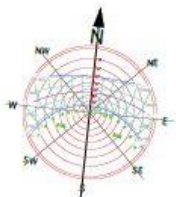
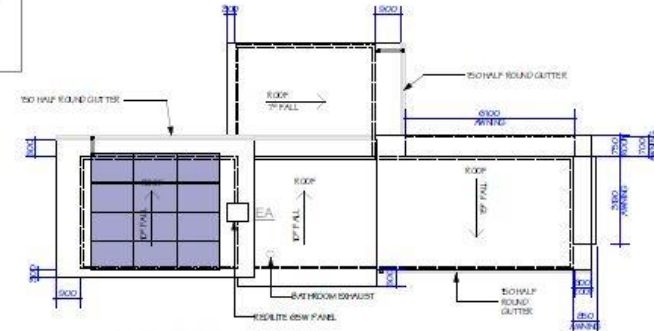
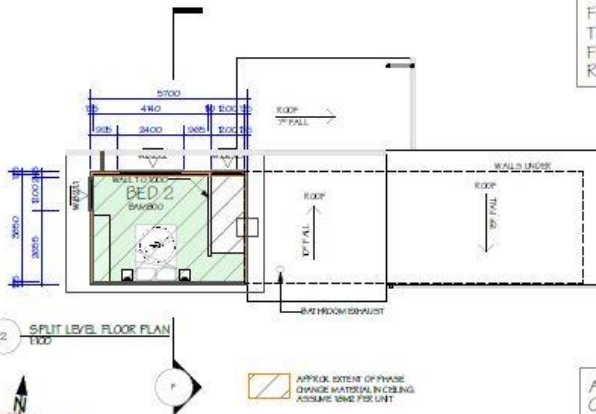
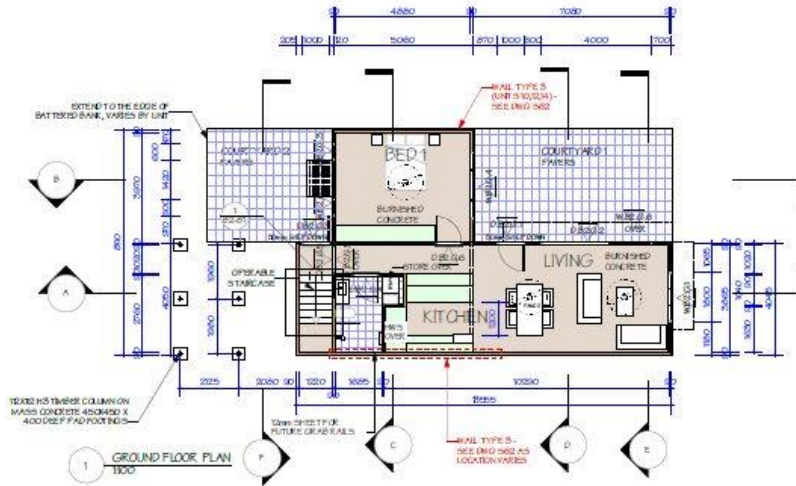
Name / Company Name: Envirotecture

ABN (if applicable): 49078853577



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# Plans, Elevations & Sections



ALL BUILDINGS WITHIN 100m OF BUSHFIRE PRONE LAND SHALL BE CONSTRUCTED TO AS3959 BAL-12.5. SEE BUSHFIRE REPORT DATED 21/7/2016

## BUILDING TYPE B2 - SPLIT LEVEL

		<b>B2-20</b>	
18 ALLIANCE ROAD, NARARA NSW 2511 OFFICE 02 9412 284 WWW.ENVIROTECTURE.COM.AU envirotecture projects Pty Ltd ABN 61 626 865 677		ACCREDITED DESIGNER STRUCTURE 2016 10/10/2016	
PROJECT: TYPE B2 SPLIT LEVEL ADDRESS: LOT 06, NARARA ECO VILLAGE, NARARA NAME: NARARA ECO VILLAGE DRAWN: FLOOR PLANS		NO-TENDER 1	





# Schedule of External Finishes

## BASIX/THERMAL COMFORT REQUIREMENTS

### External Walls

Painted render on brick veneer with R2.5 high density insulation  
FC weatherboards cladding to stud framing R2.5 insulation

### Internal walls

Fiberboard lined stud walls - R2.0 insulation generally except R3.0 for walls adjoining the roof space.

### Roof

Colorbond custom orb with 55 mm anticon blanket

### Ceilings

Fiberboard with R3.5 polyester insulation

### Floors

Ground floor - concrete slab on ground - bare, tile, carpet, timber  
First floor - timber frames with carpet, tiles and timber floors - R2.0 insulation

### Lighting

All recessed downlights to be sealed. All lighting to be LED lighting.

### Water Features

All showerheads to be minimum 3 star WELS rated - 7.5 - 9.0 l/min

All toilets to be minimum 4 star WELS rated

All taps to be minimum 4 star WELS rated

### Skylights

Double glazed clear U value = 4.22 SHGC = 0.72

### Windows

All awning windows (W2.0) to be aluminium frames with single clear glazing

- U value  $\leq 6.7$ , SHGC = 0.57 (±0%)

D03, W2.02-2.04, W2.06 - 2.13 to be aluminium frames with high solar gain Low E glazing

- U value  $\leq 5.4$ , SHGC = 0.58 (±0%)

All other windows to be aluminium frames with single clear glazing

- U value  $\leq 6.7$ , SHGC = 0.70 (±0%)

### General

Insulation, services and sealing of the building to be in accordance with BCA 4.5W 3.12

Exhaust fans to ensuite, bathrooms and laundry ISO. dia through wall or ceiling to roof eave with gampet fitted.

Rangecook exhaust through wall with gampet fitted.

All external doors and windows to be fitted with draught excluding weather stripping

Instantaneous gas hot water system - 5.5 star min.

Min. 4,000 litre rainwater tank

Min. 40 m<sup>2</sup> native endemic or low water use planting



VIEW FROM FRONT BOUNDARY

## FINISHES



Roof Sheetting  
Colorbond Custom Orb  
*'Slate Grey'*



Fascias and Bargeboards  
Gutter & downpipes,  
Colorbond *Basalt*



Glazed doors and windows frames  
*'Gull Grey'* powdercoat



Acrylic Render to  
Brick veneer walls  
Dulux 'Tranquil Retreat' PG1.F1



Acrylic Render to  
Brick veneer walls  
Dulux 'Timeless Grey' PG1.F4



Paint finish to FC  
weatherboards  
Dulux 'Milton Moon' PG1.F2



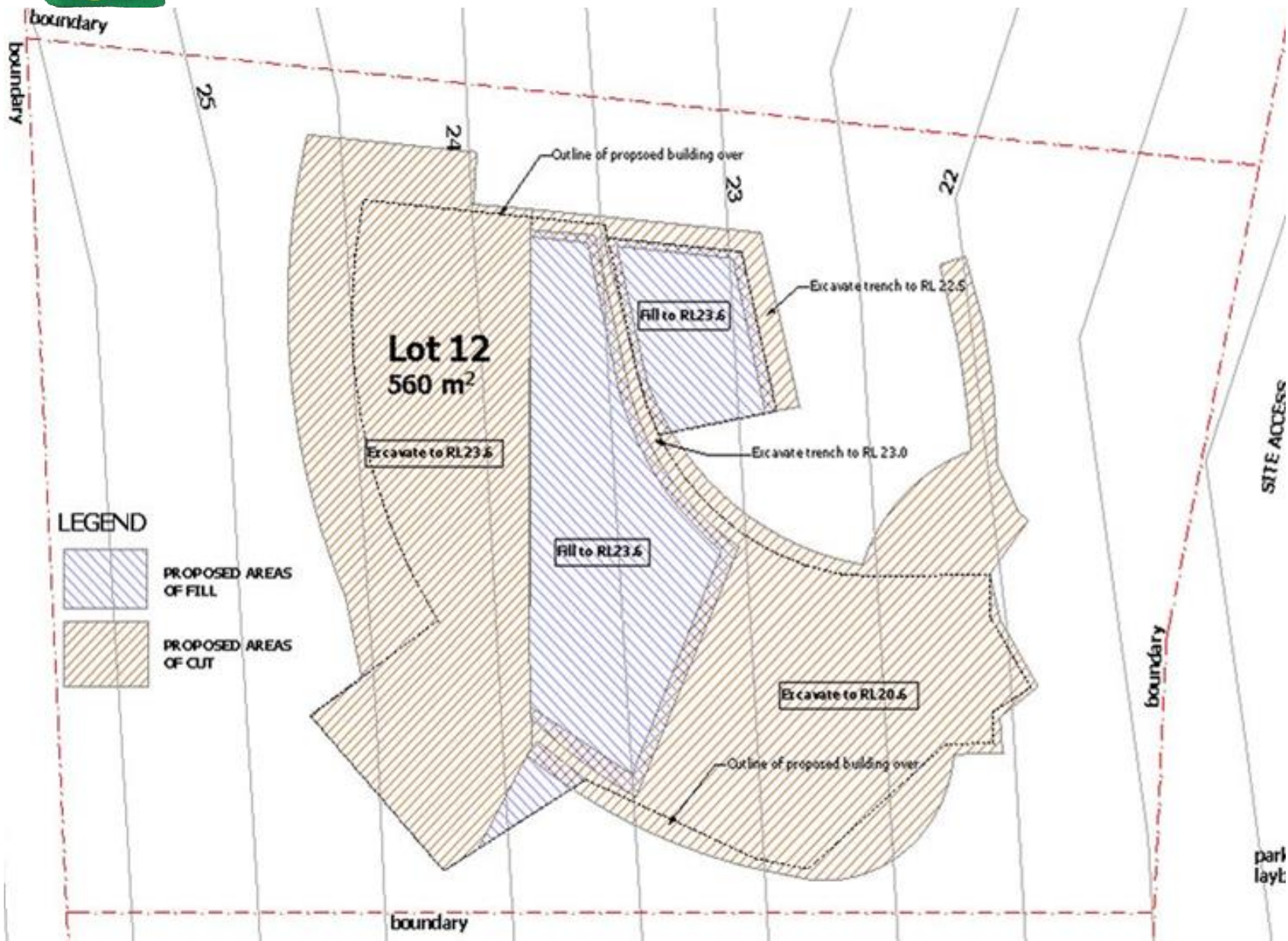
Exposed timber posts and beams  
Recycled hardwood



Paint finish to FC  
weatherboards  
Dulux 'Klute' PG1.F5



# Extent of Cut and Fill Plan







# Landscape Plan



## LEGEND

SYMBOL	BOTANICAL NAME	COMMON NAME	No.	HEIGHT AT MATURITY
--------	----------------	-------------	-----	--------------------

### SHADE TREES

	Melia azedarach	White Cedar (Chinaberry)	3	6 - 10 m
	Brachychiton acerifolius	Illawarra Flame Tree	1	10-35m
	Eucocarpus reticulatus	Blueberry Ash	1	6-8m

### SMALL TREES

Fruit Trees, final selection to be advised.				
	Citrus Limon	Lemon 'Meyer'	1	3 - 4 m
	Citrus Sinesis	Orange 'Dwarf Navelina'	1	2 - 3 m
	Citrus Latifolia	Tahitian Lime	1	3 m
	Citrus Reticulata	Manadarin	1	3 - 4 m

### LARGE SHRUBS

	Ceratopetalum gummiferum	NSW Christmas Bush	3	5-10m
	Melaleuca nodosa	-	5	1-4m

### SMALL SHRUBS

	Lavender / Rosemary	12	0.5 - 1.0 m as hedge	
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### GROUND COVER

	Crinum pendunculatum	Swamp Lily	TBC	1.0 m
	Lomandra longifolia	Mat Rush	16	1.0 m

### SCREENING PLANTS

	Hedge - Bambusa multiplex (Goldstripe / Golden Goddess)	Clumping Bamboo	4 3-4m	
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### OTHER

	Kitchen garden; herbs and salad greens
	Vegetable beds
	Common Garden Area
	Waterwise planting area

# Waste Management Plan

Part 7: General Controls - Chapter 7.2 - Waste Management

Part 7: General Controls - Chapter 7.2 - Waste Management

## 3. CONSTRUCTION (All Types of Developments)

Address of development: \_\_\_\_\_

Refer to Section 7.2.14 of the DCP for objectives regarding construction

most favourable



least favourable

## 5. CONSTRUCTION DESIGN (All Types of Developments)

Outline how measures for waste avoidance have been incorporated into the design, material purchasing and construction techniques of the development (refer to Section 7.2.14 of the DCP):

### Materials

Most of the fill under the concrete slab will be salvaged from the excess spoil left over from the subdivision infrastructure works. Recycled bricks will be used for all subfloor, foundation and retaining walls laid in lime mortar to allow for ease of disassembly. External paving will also use recycled bricks or pavers. The polyester insulation used in the roof and the lightweight walls is 100% recycled from PET bottles. The timber flooring in the kitchen, living room and hallway will be recycled hardwood. Most of the light fittings will be second hand light fittings salvaged from demolition and recycling yards. Sanitary fixtures and bathroom fittings will be sourced as second hand where possible. The kitchen will be made from second hand or -repurposed cabinets and fittings where possible. As the majority of materials to be used will be purchased in bulk or as recycled, second hand materials, the amount of packaging that comes with the materials will be minimised.

### Lifecycle

Colorbond roof sheeting will have 30 year warranty and 20 years for the Colorbond gutters and downpipes. Hemperete is fire and termite resistance and provided all round with decent eaves to ensure weather protection and so a long life is expected. The roof sheeting and framed will all be screw fixed to allow for disassembly and recycling at end of life or when renovations occur. Similarly the Weathertex cladding will also be screw fixed and can be easily removed and be available for re-use. All structural steel work shall be bolt connected not welded and so can be easily disassembled for recycling. Rammed earth walls can be broken up and the resultant material available to be used as fill. Recycled bricks used foundation and retaining walls will be laid in lime mortar to allow for ease of demolition and cleaning for re-use.

Detail the appropriate needs for the ongoing use of waste facilities including the transfer of waste between the residents or tenancy units, the servicing of waste location and frequency of waste transfer and collection. If truck access is required then engineering details are required.

An on-site compost bin and worm farm will process all vegetative food waste and some green waste. A

four bin sorting facility will be provided within the house which will allow greenwaste for compost and

worm farm to be separated and for residual waste to be separated from recyclable waste.

Residual and recycled waste will be taken to the central collection point in Narara Ecovillage

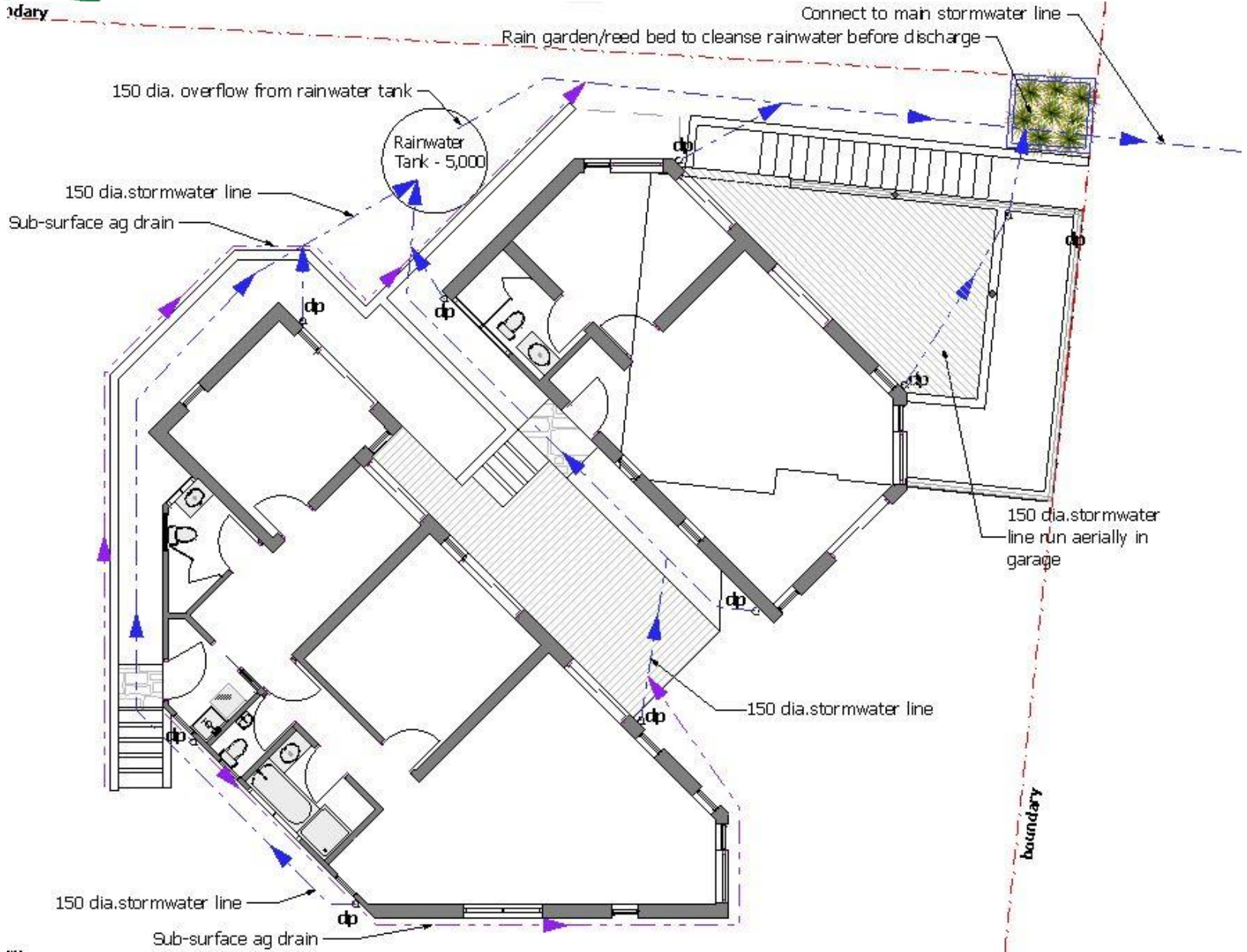
Type of waste generated	Reuse Estimate Volume (m3) or Weight (t)	Recycling Estimate Volume (m3) or Weight (t)	Disposal Estimate Volume (m3) or Weight (t)	Specify method of on site reuse, contractor and recycling outlet and/or waste depot to be used
Excavation material	50m3			If suitable used on site as fill under concrete slabs and terraces
Timber (specify)	2m3	2m3		Reuse on site as screen to garden shed, rest sent to Steptoe's Recyclers
Concrete		3m3		Delivered to Recycled Concrete Products West Gosford for crushing
Bricks		4m3		Delivered to Recycled Concrete Products West Gosford for crushing or re-sale
Tiles		1m3		Delivered to Recycled Concrete Products West Gosford for crushing
Metal (specify)		2m3		Sent to Fairhaven Services Point Clare for salvaging
Glass				
Plasterboard (offcuts)		2m3		Sent to REGYP Kurnell through NEV recycling scheme
Fixtures and fittings				If complete sent to Steptoes Recyclers Gosford
Floor coverings		0.5 m3		Only timber - if suitable sent to Steptoes Recyclers Gosford
Packaging (used pallets, pallet wrap)		4 m3	1.5 m3	Timber, cardboard, hard plastic to NEV recycling scheme, soft plastic to Council collection
Garden organics		1.5 m3		Used in NEV central compost or as mulch to common gardens
Containers (cans, plastic, glass)		0.5 m3		Recycled through central collection with NEV recycling scheme
Paper/cardboard		1 m3		Saved for mulch for common gardens or recycled through NEV recycling scheme
Residual waste			2 m3	Collected through NEV central collection point for collection by Council
Hazardous/special waste (specify)				





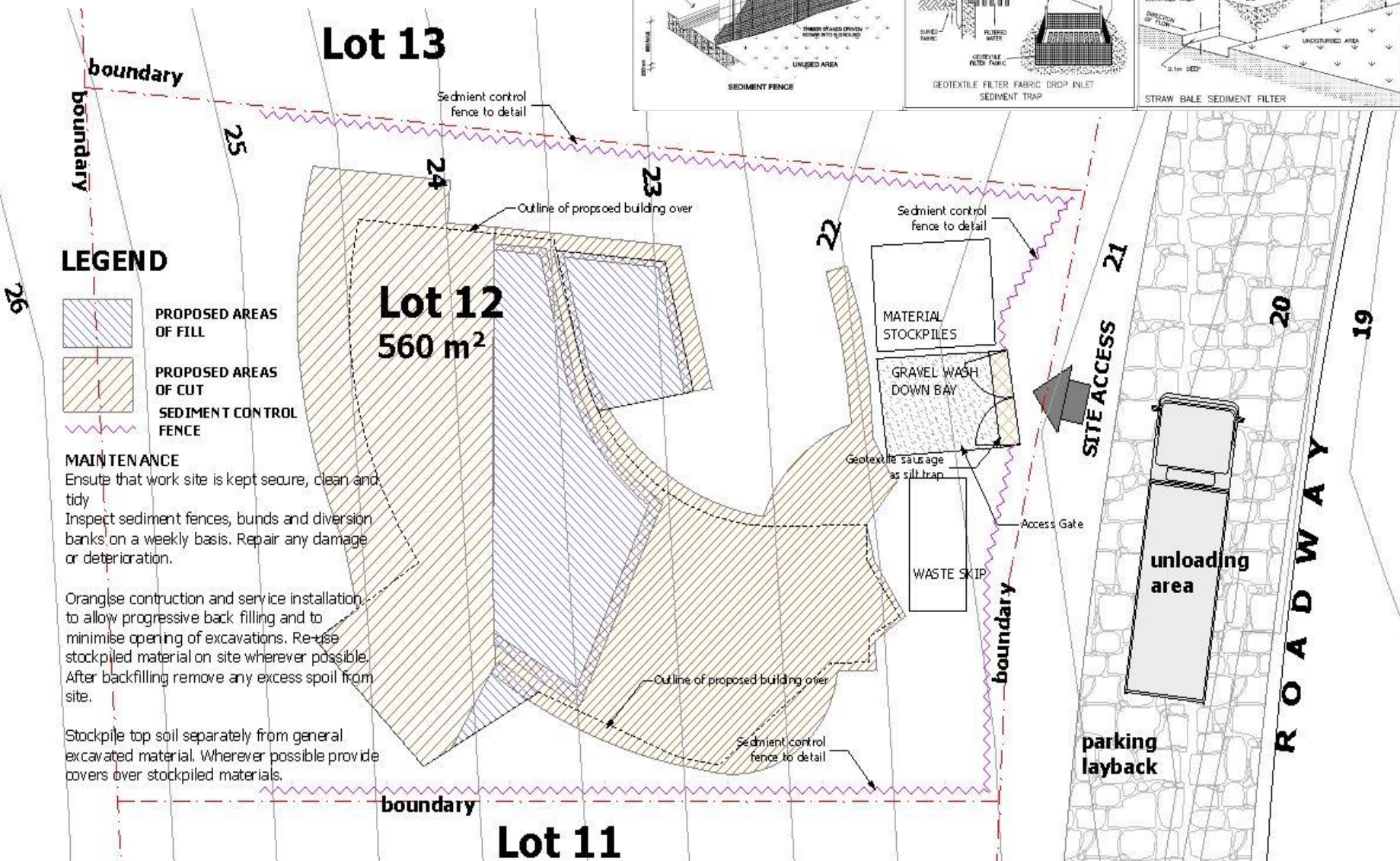
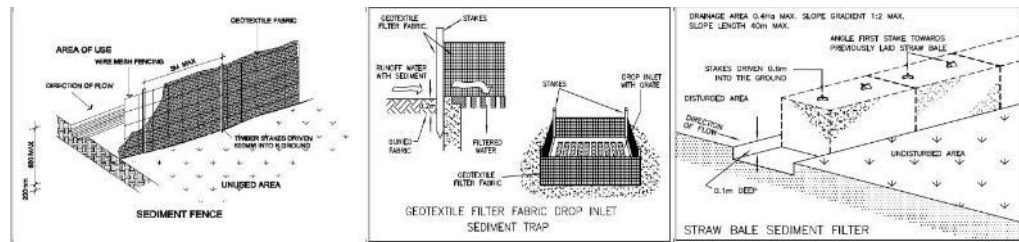
Narara  
ecovillage  
inspired by life

# Stormwater Management





# Erosion & Sediment Control





# Bushfire Report

## NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Printed: 22/04/2016 Assessment Date: 8/04/2016

Site Street Address: 25 Research Road (Cluster house), Narara  
 Assessor: Mr Admin; admin  
 Local Government Area: Gosford Alpine Area: No

### Equations Used

Transmissivity: Fuss and Hammins, 2002  
 Flame Length: RFS PBP, 2001  
 Rate of Fire Spread: Noble et al., 1980  
 Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005  
 Peak Elevation of Receiver: Tan et al., 2005  
 Peak Flame Angle: Tan et al., 2005

Run Description: C West BAL 12.5

### Vegetation Information

Vegetation Type: Forest Vegetation Group: Forest and Woodland  
 Vegetation Slope: 16 Degrees Vegetation Slope Type: Upslope  
 Surface Fuel Load(t/ha): 25 Overall Fuel Load(t/ha): 35

### Site Information

Site Slope: 11 Degrees Site Slope Type: Upslope  
 Elevation of Receiver(m): Default APZ/Separation(m): 27

### Fire Inputs

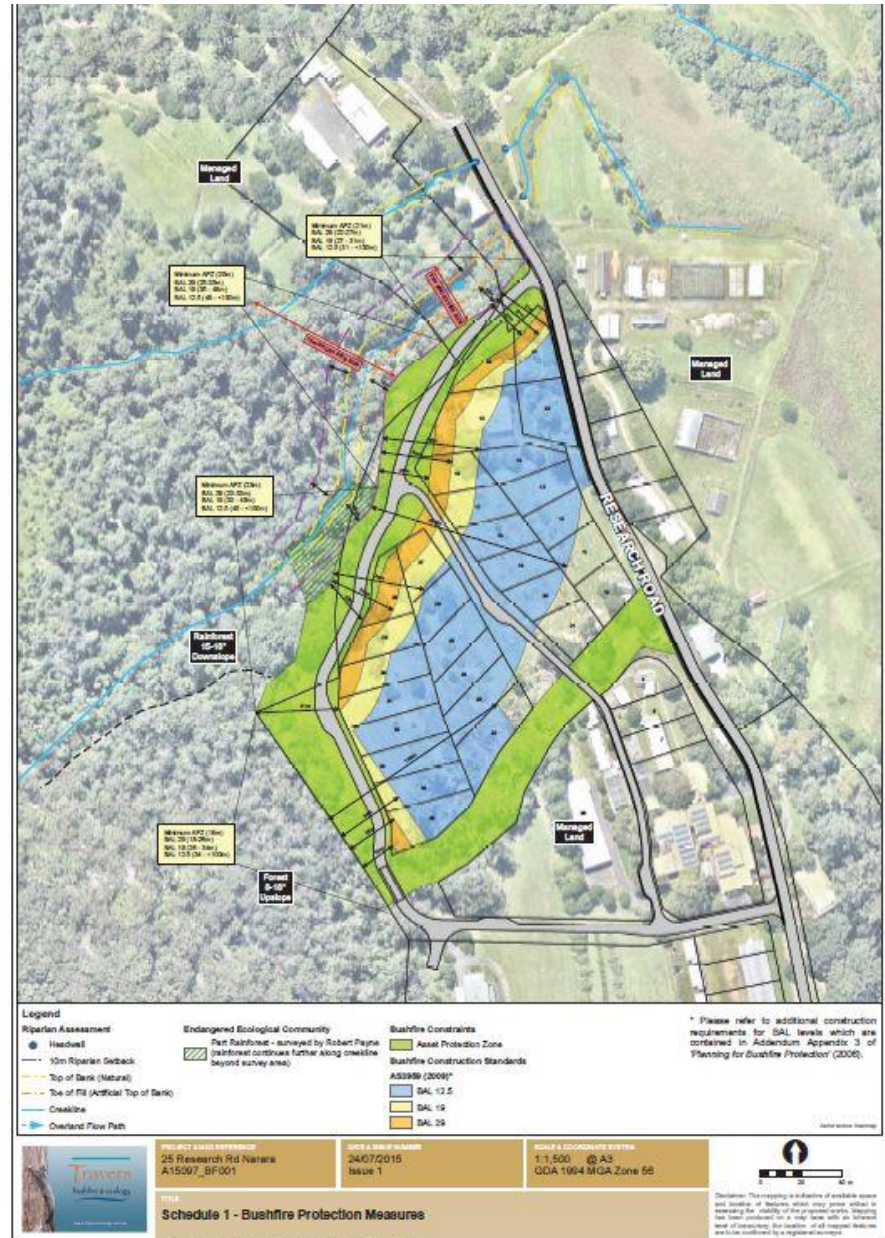
Veg./Flame Width(m): 100 Flame Temp(K): 1090

### Calculation Parameters

Flame Emissivity: 95 Relative Humidity(%): 25  
 Heat of Combustion(kJ/kg): 18600 Ambient Temp(K): 308  
 Moisture Factor: 5 FDI: 100

### Program Outputs

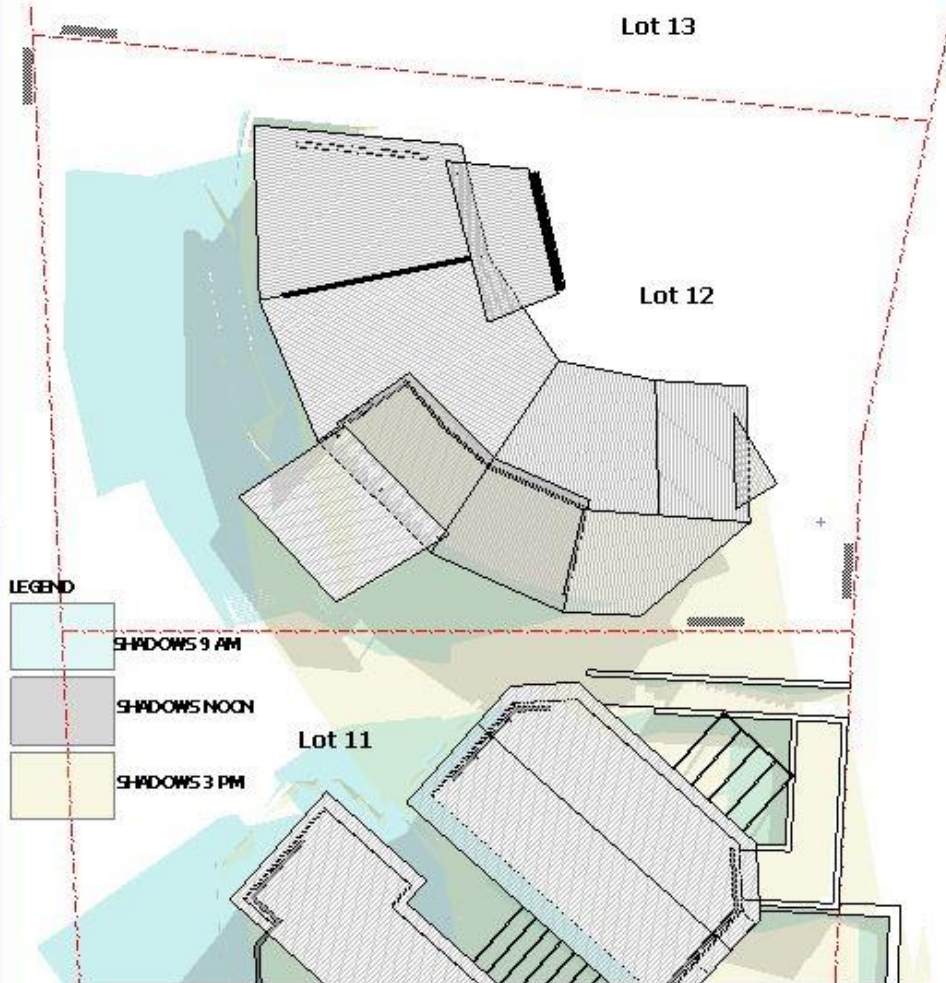
Category of Attack: LOW Peak Elevation of Receiver(m): 10.16  
 Level of Construction: BAL 12.5 Fire Intensity(kW/m): 17986  
 Radiant Heat(kW/m<sup>2</sup>): 12.43 Flame Angle (degrees): 67  
 Flame Length(m): 10.67 Maximum View Factor: 0.2  
 Rate Of Spread (km/h): 0.99 Inner Protection Area(m): 18  
 Transmissivity: 0.817 Outer Protection Area(m): 9





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# Shadow diagrams



SHADOW DIAGRAMS WINTER SOLSTICE



ELEVATION - LOT 11 3 PM WINTER SOLSTICE



ELEVATION - LOT 11 1:30 PM WINTER SOLSTICE



ELEVATION - LOT 11 NOON WINTER SOLSTICE



ELEVATION - LOT 11 9 AM WINTER SOLSTICE



PROPOSED RESIDENCE  
AT Lot 12 NARARA ECOVILLAGE  
for Deborah & Daniel Mohr


G. E. HURT

DALIC

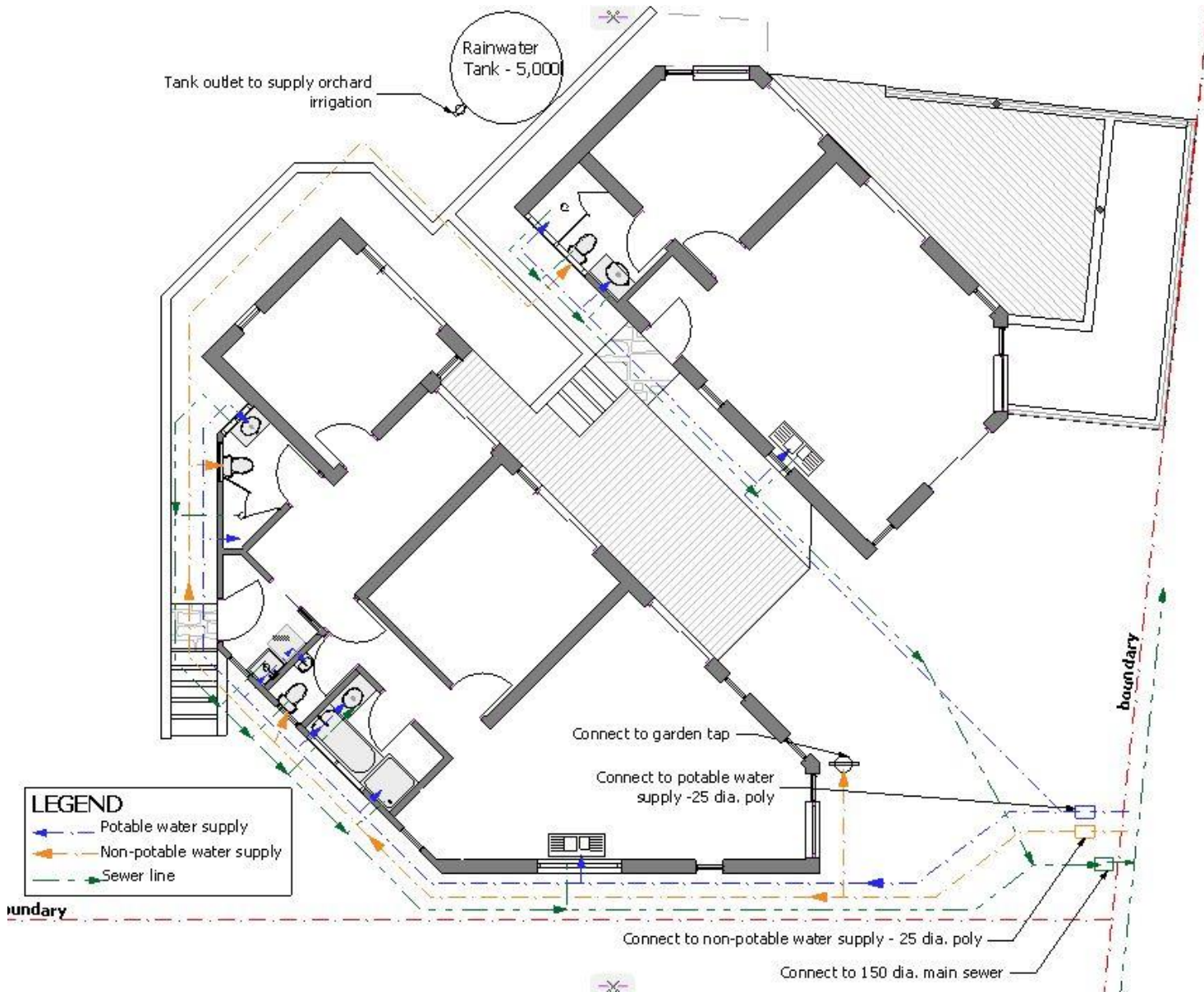
Shadows





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ecovillage  
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# Water & Sewer Plan



# NatHERS Certificate

THERMAL COMFORT SPECIFICATION		
Item	Material	Insulation
External Walls	300 mm th. Hempcrete fixed to stud wall framing with lime render both sides medium colour external	None
	Weatherex fixed to battens with breathable membrane fixed to stud wall framing with MGO board internally dark colour external	R2.5 high density polyester insulation
Internal walls	350 mm th. rammed earth wall	None
	MGO lined stud walls -	R2.5 high density polyester insulation
Roof	Metal deck with, light colour	Breathable membrane – CSR ProctorWrap HTR
Ceilings	Plasterboard	R5.0 polyester insulation
Floor structure	Concrete	
Floor finishes	Burnished concrete except floating timber to part living room, kitchen, hall, tiles to wet areas	N/A
Windows	Sliding windows, Sliding glazed doors, louvre and fixed windows - timber framed with single clear glass U value = 5.4 SHGC = 0.63 or equivalent Awning and casement windows, hinged glazed doors - timber framed with single clear glass U value = 5.4 SHGC = 0.56 or equivalent All external doors and windows to be fitted with draught excluding weather stripping	
Lighting	No recessed downlights	
General	Insulation, services and sealing of the building to be in accordance with BCA NSW 3.12. All exhaust fans to be max. 180 mm dia. be sealed or fitted with damper and exhaust through roof	

### Nationwide House Energy Rating Scheme\* — Multiple-dwelling summary

Certificate number: 0000428600

Certificate Date: 24 Jun 2016

★ Average Star rating: 7.5



#### Assessor details

Accreditation number: 20374  
Name: Stephen Collins  
Organisation: Concept Designs Australia  
Email: [conceptdesigns@tpg.com.au](mailto:conceptdesigns@tpg.com.au)  
Phone: 0418 877 571  
Declaration of interest: None  
Software: BERS Pro v4.3.0.1 (3.13)

AAO: ABSA



#### Dwelling details

Street: Research Road  
Suburb: NARARA  
State: NSW  
Postcode: 2250

Scan to access this certificate online and confirm this is valid.



#### Summary of all dwellings

##### Certificate Details

Certificate number	Dwelling/Unit number	Heating load	Cooling load	Total load	Star Rating
0000417907	1	7	14	21	8.9
0000417915	2	8	13	21	8.9
0000417923	3	8	13	21	8.9
0000418004	4	8	13	21	8.9
0000418038	5	23	35	58	6.4
0000418079	6	27	36	63	6.3
0000418160	7	24	34	58	6.6
0000418202	9	16	20	36	7.9
0000418228	10	20	20	40	7.7
0000418319	11	22	23	45	7.3
0000418343	12	22	24	46	7.3
0000418426	13	18	21	39	7.8
0000420638	14	22	24	46	7.3
0000420695	15	29	19	48	7.2
0000420737	8	24	34	58	6.4



UNIT TYPE	AREA (m <sup>2</sup> )
FLOOR AREA TYPE A (FIBRE)	58.4
FLOOR AREA TYPE B (FIBRE)	58.4
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FLOOR AREA TYPE JC (FIBRE)	58.4
FLOOR AREA TYPE JD (FIBRE)	58.4
FLOOR AREA TYPE JE (FIBRE)	58.4
FLOOR AREA TYPE JF (FIBRE)	58.4
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FLOOR AREA TYPE JV (FIBRE)	58.4
FLOOR AREA TYPE JW (FIBRE)	58.4
FLOOR AREA TYPE JX (FIBRE)	58.4
FLOOR AREA TYPE JY (FIBRE)	58.4
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FLOOR AREA TYPE KA (FIBRE)	58.4
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FLOOR AREA TYPE KF (FIBRE)	58.4
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FLOOR AREA TYPE KR (FIBRE)	58.4
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FLOOR AREA TYPE KV (FIBRE)	58.4
FLOOR AREA TYPE KW (FIBRE)	58.4
FLOOR AREA TYPE KX (FIBRE)	58.4
FLOOR AREA TYPE KY (FIBRE)	58.4
FLOOR AREA TYPE KZ (FIBRE)	58.4
FLOOR AREA TYPE LA (FIBRE)	58.4
FLOOR AREA TYPE LB (FIBRE)	58.4
FLOOR AREA TYPE LC (FIBRE)	58.4
FLOOR AREA TYPE LD (FIBRE)	58.4
FLOOR AREA TYPE LE (FIBRE)	58.4
FLOOR AREA TYPE LF (FIBRE)	58.4
FLOOR AREA TYPE LG (FIBRE)	58.4
FLOOR AREA TYPE LH (FIBRE)	58.4
FLOOR AREA TYPE LI (FIBRE)	58.4
FLOOR AREA TYPE LJ (FIBRE)	58.4
FLOOR AREA TYPE LK (FIBRE)	58.4
FLOOR AREA TYPE LL (FIBRE)	58.4
FLOOR AREA TYPE LM (FIBRE)	58.4
FLOOR AREA TYPE LN (FIBRE)	58.4
FLOOR AREA TYPE LO (FIBRE)	58.4
FLOOR AREA TYPE LP (FIBRE)	58.4
FLOOR AREA TYPE LQ (FIBRE)	58.4
FLOOR AREA TYPE LR (FIBRE)	58.4
FLOOR AREA TYPE LS (FIBRE)	58.4
FLOOR AREA TYPE LT (FIBRE)	58.4
FLOOR AREA TYPE LU (FIBRE)	58.4
FLOOR AREA TYPE LV (FIBRE)	58.4
FLOOR AREA TYPE LW (FIBRE)	58.4
FLOOR AREA TYPE LX (FIBRE)	58.4
FLOOR AREA TYPE LY (FIBRE)	58.4
FLOOR AREA TYPE LZ (FIBRE)	58.4
FLOOR AREA TYPE MA (FIBRE)	58.4
FLOOR AREA TYPE MB (FIBRE)	58.4
FLOOR AREA TYPE MC (FIBRE)	58.4
FLOOR AREA TYPE MD (FIBRE)	58.4
FLOOR AREA TYPE ME (FIBRE)	58.4
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FLOOR AREA TYPE MI (FIBRE)	58.4
FLOOR AREA TYPE MJ (FIBRE)	58.4
FLOOR AREA TYPE MK (FIBRE)	58.4
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FLOOR AREA TYPE MN (FIBRE)	58.4
FLOOR AREA TYPE MO (FIBRE)	58.4
FLOOR AREA TYPE MP (FIBRE)	58.4
FLOOR AREA TYPE MQ (FIBRE)	58.4
FLOOR AREA TYPE MR (FIBRE)	58.4





# Access Statement

<b>ACCESS &amp; LIVABILITY STATEMENT</b>			
To be read in conjunction with Livable Housing Design Guidelines - <a href="http://livablehousingaustralia.org.au/">http://livablehousingaustralia.org.au/</a>			
<b>Item</b>	<b>Requirement</b>	<b>Provided</b>	<b>Level achieved</b>
<b>Dwelling Access</b>	Provide a safe, continuous pathway from the street entrance and/or parking area to the dwelling entrance	Not applicable as average ground slope is steeper than 1:14. However pathway with grades no greater than 1:10 is provided to rear exit and connecting to common pathway in Common garden	N/A
<b>Dwelling entrance</b>	There is at least one level (step-free) entrance into the dwelling to enable home occupants to easily enter and exit the building	Landing provided is > 1.5 m x 1.5 m and covered by roof, door is > 900 mm wide with level transition	Platinum
<b>Car parking</b>	Where the parking space is part of the dwelling access it should allow a person to open their car doors fully and easily move around the vehicle.	Not applicable as no car parking is provided on the site	N/A
<b>Internal doors &amp; corridors</b>	Internal doors and corridors facilitate comfortable and unimpeded movement between spaces.	Internal width of hallways = 1.2m Clear openings of doors = 900 mm Level transition at all doorways	Platinum
<b>Toilet</b>	The ground (or entry) level has a toilet to support easy access for home occupants and visitors.	1.2 m clear between side walls of toilet room. 1.2m clear circulation space forward of toilet pan, toilet in corner for future fixing of grab rails	Gold
<b>Shower</b>	The bathroom and shower is designed for easy and independent access for all home occupants.	Shower recess 0.9m x 0.9 m clear internal, 1.2m x 1,2m clear circulation space forward of hobless entry to shower, shower in corner for future fixing of grab rails	Gold
<b>Reinforcement of bathroom and toilet walls</b>	The bathroom and toilet walls are built to enable grab rails to be safely and economically installed.	Additional noggings placed in all toilet and shower room walls	Silver
<b>Internal Stairways</b>	Where installed, stairways are designed to reduce the likelihood of	Continuous handrail fixed to one side of staircases	Silver







# NEV Rating Tool Result

NEV building standards scoresheet													Enter your numbers in column "I".	
No.	Category	Sub-category	Goal	Criteria	Initial Target %*	WEIGHTING POINTS (%age)	Expectation Based on a 120 SqM design	Enter your value here	Units	YOUR SCORE	Instruction	Further help  (Links to appropriate section of user guide)		
16		Construction resource recovery	To reduce waste going to landfill	Construction waste reuse and recycling - Amount and types recycled; Amount of waste and destination; Design sizing & packaging minimisation	0.7	5	80%	0	NEV points	0	As will be verified from construction waste disposal receipts, enter the percentage of waste that is proposed to be recycled. Full details of the Construction Management Plan requirements can be found under that title "Annexe 1_Definitions". Currently page 45.	<a href="#">Construction Waste</a>		
17	INDOOR	Indoor Environmental Quality (IEQ)	To optimise sustainability & health	Indoor air quality; natural light, acoustic comfort;		5	7	5	NEV points	4	Enter 1 point each for:- <ul style="list-style-type: none"> <li>* sufficient internal daylight in all rooms</li> <li>* sufficient cross ventilation in each room</li> <li>* use of low VOC paints</li> <li>* use of low formaldehyde joinery and panel materials</li> <li>* avoidance of dust trapping materials such as carpets, fabrics, high shelves etc</li> <li>* noise abatement through the use of insulation (external as well as internal)</li> <li>* breathable wall materials such as hempcrete or strawbale, breathable paints or membranes in wall and roof construction or providing additional ventilation to roof</li> </ul>	<a href="#">Indoor</a>		
18	OTHER	Other		Improve access for occupants over time; ease of adapting house for future uses; ability to withstand severe external forces	Meet liveability guidelines	5	4	1	NEV points	1.3	For the Liveability self assessment, enter:- <ul style="list-style-type: none"> <li>* 1 point if comply with 70% of Liveable Housing Silver level design guidelines</li> <li>* 2 points if comply with Silver Certification of Liveable Housing design guidelines</li> <li>* 3 points if comply with Gold Certification of Liveable Housing design guidelines.</li> <li>* 4 points if comply with Platinum Certification of Liveable Housing design guidelines.</li> </ul> Deduct one point from each of the last 3 items for self assessment of the Liveable Housing Design Guidelines. <ul style="list-style-type: none"> <li>* 1 point for resilient design through use of durable materials, enhanced</li> </ul>	<a href="#">Other</a>		
		<b>Individual House Total</b>	<b>Achieving a total of 70 points is mandatory</b>			<b>100</b>	<b>Your progressive score is =</b>		<b>70</b>	<b>Pass level = 70, plus mandatory PV and 7 stars (if fail, message indicates "does not meet Narara Ecovillage Bldg Stds")</b>		<b>Total</b>		
19	<b>BONUS POINTS</b>	Innovation Innovative house designs or materials	Foster new ideas such as:- Earth ships Pre-fabricated homes Bio Fuel / Bio Mass usage Phase Change Materials for Thermal Mass	Owners to demonstrate how elements exceed Category minimums	N/A				Bonus points	0.0	<b>This not capped but is issued at the discretion of the BRP. Please seek advice from the BRP if your proposal would be eligible for bonus points. Awarded on a case by case basis by the BRP. Criteria and guidelines to be set by the BRP..</b>	<a href="#">Bonus Points</a>		
20		Food production				3	3			0.0	Enter:- <ul style="list-style-type: none"> <li>* 1 point if 25% or more of landscaped area is food garden</li> <li>* 2 points if 50% or more of landscaped area is food garden</li> <li>* 3 points if 75% or more of landscaped area is food garden</li> </ul>			
21		Open Design presentation				3	3			0	Enter 3 points if design has been presented to the membership for sociocratic			
<b>Note that innovations are not capped, but the remaining bonuses are capped at a total of 5 points</b>						<b>75</b>	<b>Grand total =</b>		<b>70</b>					



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# Energy Efficiency Assessment

<b>BASIX SPECIFICATION</b>	
<b>Item</b>	<b>Description</b>
<b>Rainwater tank</b>	3,500 litre connected to garden
<b>Hot Water system</b>	Sanden 250l. electric heat pump
<b>NEV Recycled Water</b>	connected to toilets and garden
<b>Water Fixtures</b>	Showers max. 6.5 l/minute Toilets 4 star WELS rating Taps 5 star WELS rating
<b>Heating and Cooling</b>	Ceiling fans only
<b>Lighting</b>	LED fixtures throughout
<b>Renewable Energy</b>	5kW PV system connect to NEV mini-grid
<b>Appliances</b>	Induction cook top, electric oven, ventilated fridge space, external & sheltered clothesline

<b>ENERGY EFFICIENCY</b>	
<b>Item</b>	<b>Description</b>
<b>Rainwater Pump</b>	Efficient pump fitted with 30 l holding tank
<b>Hot Water system</b>	Electric heat pump fitted with timer to run during middle of day
<b>Heating and Cooling</b>	Ceiling fans only
<b>Lighting</b>	LED fixtures throughout 3.5 W/m <sup>2</sup> for interior of houses 2.8 W/m <sup>2</sup> for verandah, balcony or deck of houses, 2.0 W/m <sup>2</sup> for outbuildings (sheds and garages).
<b>Renewable Energy</b>	Battery system to be connected to PV system within 5 years
<b>Appliances</b>	Fridge/freezer of 2.5 stars - Model No. Dishwasher 4 stars - Model No. Clothes washer 4 stars - Model No. Clothes dryer 2.5 stars - Model No.



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# Building Materials Statement

MATERIAL SPECIFICATION		
Item	Material	Notes
<p><b>Renewable Materials</b></p> <p>It is estimated that approx. 30% of the main structure will be from renewable materials – being approx. 85 m<sup>3</sup> of a tail structure volume of 195 m<sup>3</sup>.</p>	External walls - Hempcrete	Hempcrete which uses hemp fibres – a renewable plant material which is locally grown in the Hunter Valley. The frame of all external walls will be H2 timber sourced through the AFS (Australian Forestry Standard) chain of custody and treated with permethrin Light Organic Solvent Preservative
	External walls - Weathertex	The remaining external walls use Weathertex cladding which is made from waste materials from the timber logging and milling process and has a Platinum GreenTag rating
	Internal walls	A large portion of the internal walls will be rammed earth. Although not strictly a renewable product as there is only a finite amount of naturally occurring earth, it is a natural material that entails little energy in its production. It is hoped that the some of the significant amount of spoil that has been created with the subdivision infrastructure project could be used for the rammed earth. If this is the case then the energy involved in transporting such a product to the site from a remote quarry or location can be avoided and thus further reducing the impact.
	Floor finishes	The linoleum floor covering in the bedrooms is made from natural renewable materials – linseed oil, jute and flax.
<b>Recycled Content</b>	Fill	Most of the fill under the concrete slab will be salvaged from the excess spoil left over from the subdivision infrastructure works.
	Concrete	The floors will be made from reinforced concrete. The reinforcing steel is all made from recycled scrap metal. The concrete specified will use recycled aggregate from crushed concrete and other sources. The amount of Portland cement in the mix will be reduced by the use of substitutes such as fly ash which is a recycled waster product from coal power stations or blast furnace slag which is a by-product from steel production.
	Subfloor and foundation walls	Recycled bricks will be used for all subfloor, foundation and retaining walls and laid in lime mortar to allow for ease of disassembly.
	Insulation	The polyester insulation used in the roof and the lightweight walls is 100% recycled from PET bottles.





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# Indoor Environment Quality

INDOOR ENVIRONMENT QUALITY	
Item	Description
Internal Daylight	<p>Living/dining/kitchen space has openable windows on three sides; study and the end bedroom have openable windows on two sides. The stairwell has openable windows at each end. The hallway has high level windows for light and ventilation. The middle bedrooms have large north facing sliding doors but also louvre window fanlights above the internal doors to the hallway which borrow light from the hallway clerestorey windows. Similarly, the service rooms such as shower, vanity, WC and laundry also have louvre fanlights above the doors into the hallway as well as openable windows on the opposite external walls.</p> <p>The light entering the high level clerestorey windows reflects directly off the ceiling and upper walls ensuring good glare free light at the lower level. The fanlights above the doors ensure that some of this light is distributed into the adjacent rooms.</p> <p>The good size of the windows and openings ensure that the area of glass and openings provide well in excess of the minimum required under Part 3.8 of the BCA (Building Code of Australia). The minimum requirement for light is to have an area of opening or glazing <math>\geq 10\%</math> of the floor area. For the bedrooms, the area of glazing is over 30% of the floor area of the room, for the study over 40% and for the living/dining/kitchen area over 30%</p>
Cross ventilation	<p>The arrangement of windows and openings on more than one side in each room means that all rooms have good cross flow ventilation as well as even distribution of light through the rooms. The high level clerestorey windows in the hallway due to the height difference to the lower windows and openings can induce a 'stack effect' ventilation flow due to pressure and temperature difference even when there is no external breeze or air movement, If the louvre fanlights above the doors are open at night, this ensures some air movement through the rooms on the warmest stillest nights.</p> <p>The good size of the windows and openings ensure that the area of glass and openings provide well in excess of the minimum required under Part 3.8 of the BCA (Building Code of Australia). The minimum requirement for ventilation in a habitable room is to have an area of opening <math>\geq 5\%</math> of the floor area. For the bedrooms, the area of opening for ventilation is over 35% of the floor area of the room, for the study nearly 40% and for the living/dining/kitchen area over 12% and so are well above the required minimum.</p>
Breathability	<p>To minimise condensation within the home, the main external wall construction is hempcrete which is breathable which will allow water vapour to pass through the wall rather than remained trapped within the building. for the remaining walls and roof a breathable membrane will be used to again allow the building to breathe. This reduces the risk of condensation and the build-up of mould within the home.</p>





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# Innovation Strategy Statement



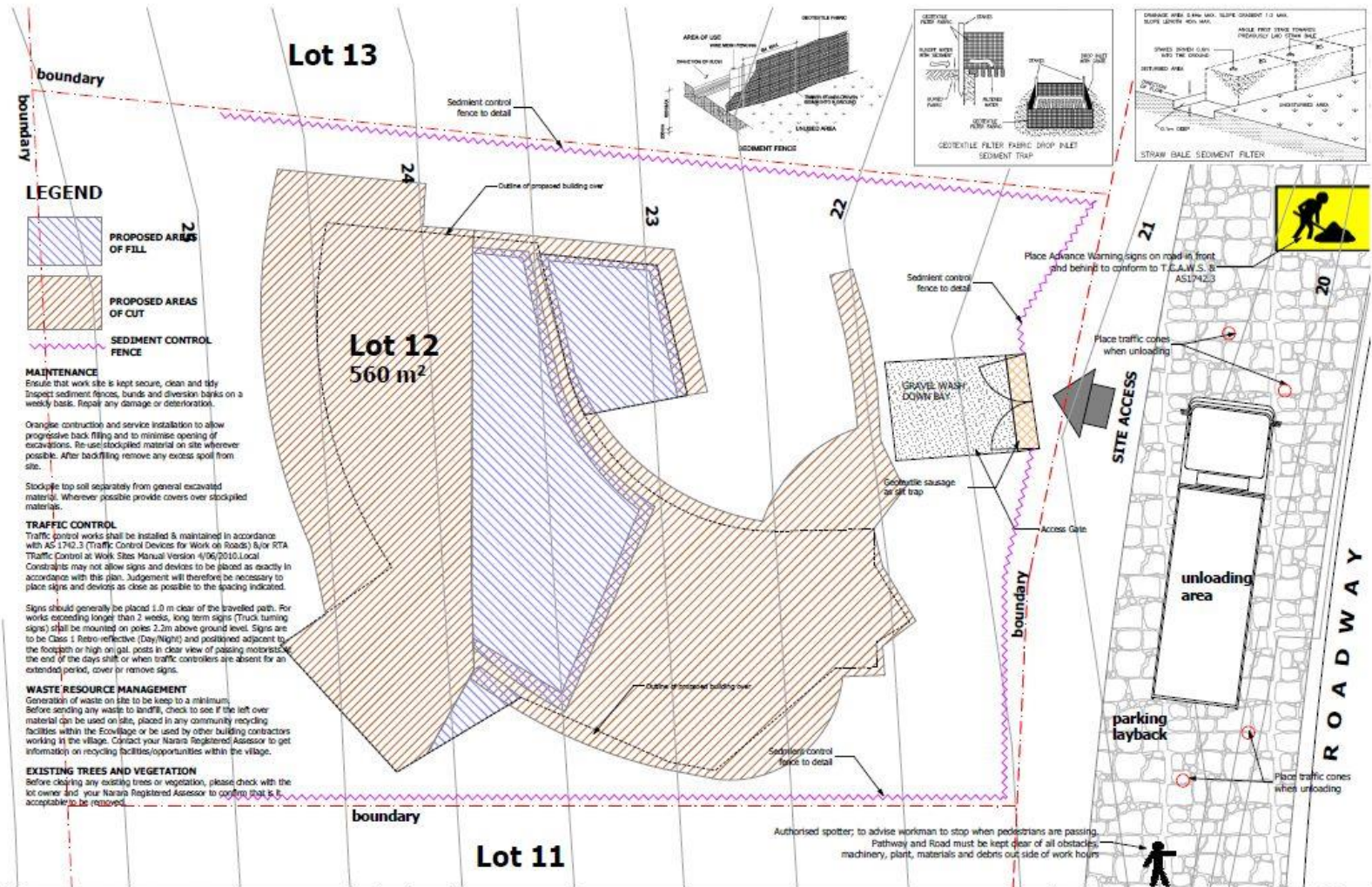
INNOVATION STATEMENT	
Item	Description
<b>Proposed Innovation</b>	Earth covered house – rear of house to be excavated into the ground with berm walls and entire roof to be a green roof
<b>Has this been done before?</b>	There have been numerous houses built like this throughout Australia but we are not aware of any being built on the Central Coast.
<b>Why is it innovative?</b>	There has been a lot of publicity about green roofs and earth covered buildings but they are rarely built especially in a suburban setting. Often they are only built in rural or bush settings.
<b>Environmental Benefits</b>	<ul style="list-style-type: none"> <li>• Improved thermal performance inside home due to shading effect and increased thermal mass</li> <li>• Reducing heat and glare reflectivity and improved transpiration from the plants growing on the roof that help to reduce the urban heat island effect</li> <li>• Much improved bushfire resilience for the structure and its occupants</li> <li>• Increased bio-diversity due to the plants and micro-habitat that can grow on the roof</li> <li>• Reduced stormwater run-off compared to a conventional hard roof</li> <li>• Feeling of well-being for occupants being better connected with the natural surroundings</li> <li>• Excellent acoustic performance within the home which also reduces the noise impact on neighbours</li> <li>• Reduced visual impact on neighbours as the house is half-buried</li> </ul>
<b>Environmental Impacts</b>	<ul style="list-style-type: none"> <li>• Increase embodied energy in the heavy structure required to hold the roof up. This is to be minimised by using recycled brick and stone in the walls.</li> <li>• Possible disruption to natural drainage as a result of excavation. The level of excavation is to be optimised so that the extent of cut matches the extent of fill.</li> </ul>





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# Construction Management Plan



PROPOSED RESIDENCE AT Lot 12 NARARA ECOVILLAGE for Deborah & Daniel Mohr	REV	DATE	NOTES		<b>G. E. HUNT</b> ARCHITECT	Phone: (02) 97800016 Web: 0452 547 407 87 Edwin Street North PO Box 21 CROYDON NSW 2132 Reg. No. 6354 ARBIA # 20127 Email: ge.hunt@geehunt.com.au www.geehunt.com.au	SCALE	1:100 @ A3	draft DA <b>CONSTRUCTION</b> <b>MANAGEMENT PLAN</b>
							DATE	25/01/2017	



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## Back tomorrow

