PRESENTATION TO THE ECOCITY WORLD SUMMIT

Melbourne Australia 12 July 2017

A personal reflection on Mullum Creek by Paul Haar Architect

MULLUM CREEK

DESIGN . ENVIRONMENT . DONVALE

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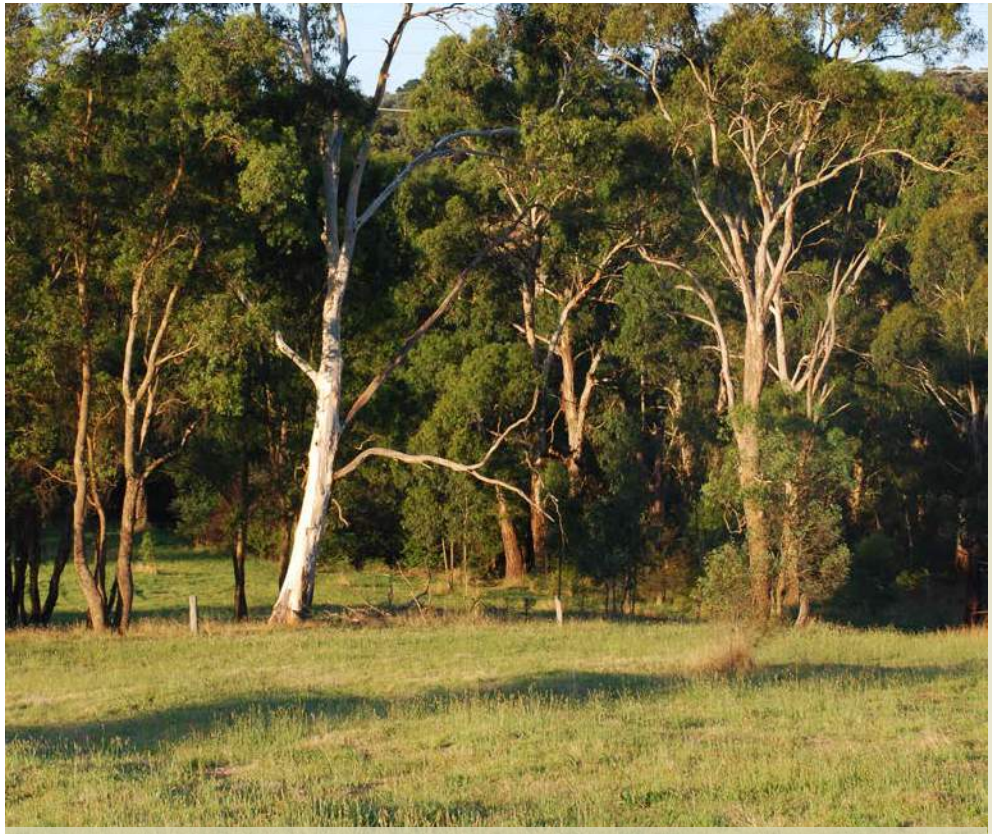
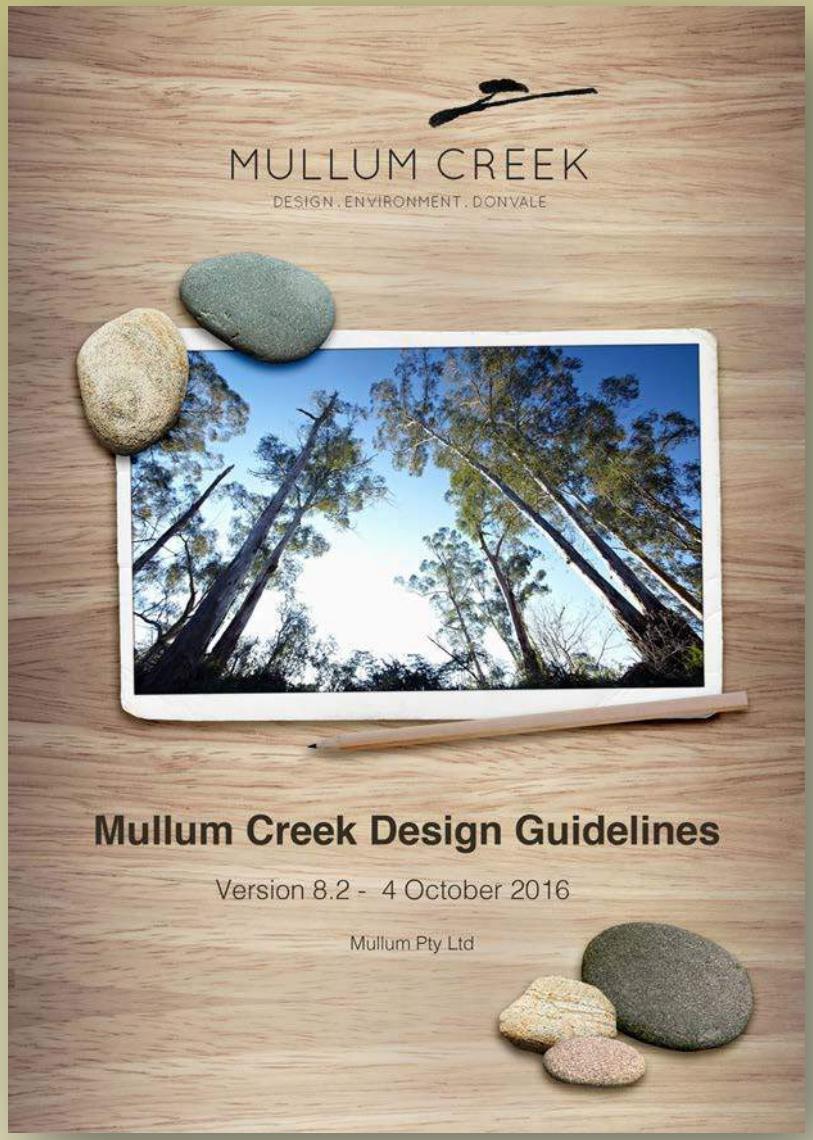
Mullum Creek is a 56 lot housing estate now under construction in one of the last pockets of residential land remaining undeveloped alongside the Mullum Mullum Creek, just 20km from Melbourne's CBD. Its beautiful natural setting was the childhood home of three siblings Sue, Steve and Danny Mathews.



the mullum creek site

some of the peri-urban housing context

In the following decades, this land became virtually surrounded by peri-urban residential subdivision of possibly the least environmentally sensitive kind. The status quo for Council and for local residents was severely challenged when the Mathews first applied to develop the property as an exemplar for sustainable living back in 2006.



- Introduction
- Design Review Process
- Siting and landform response
- Building design
- Materials and finishes
- Energy and water
- Your landscape

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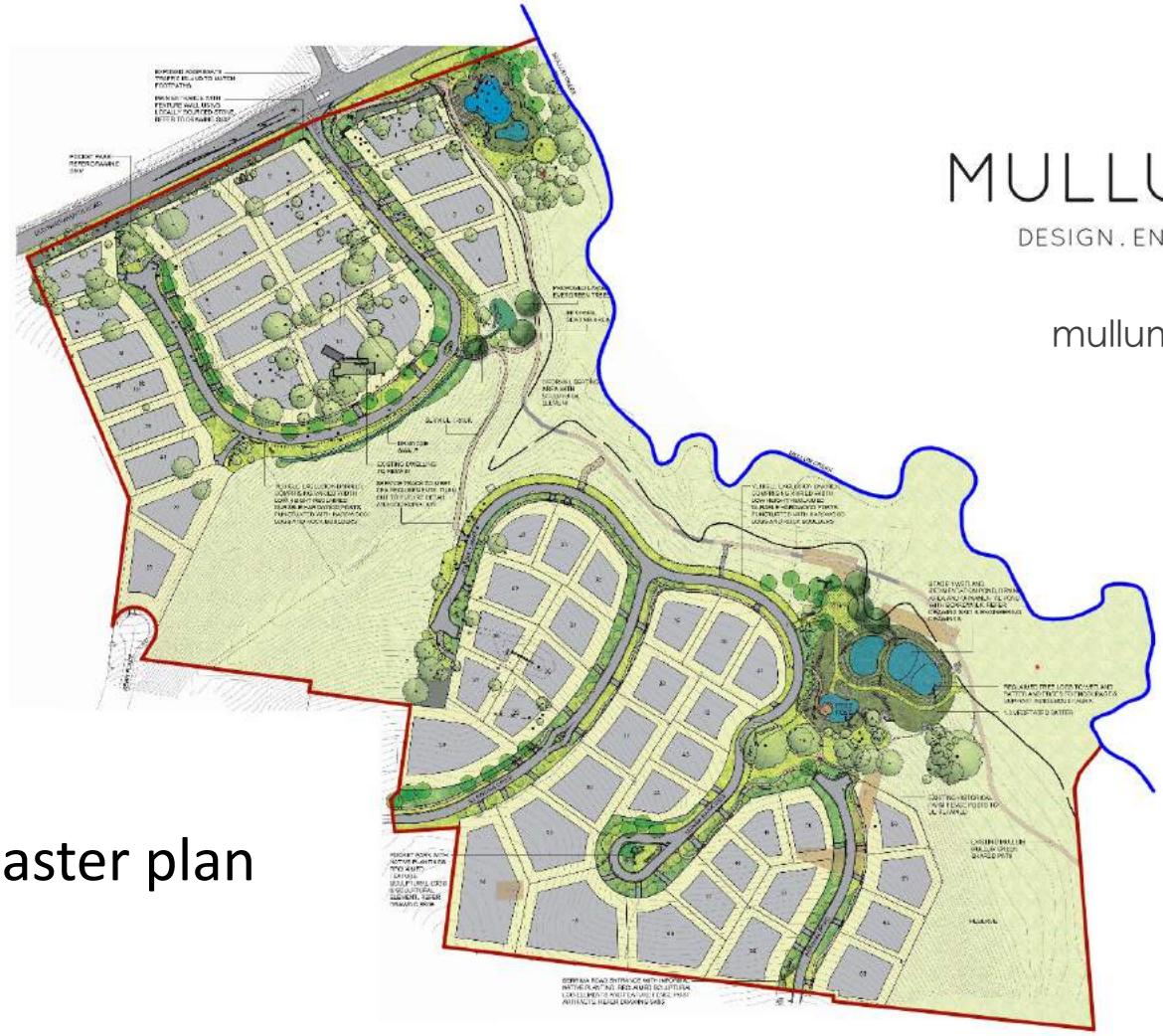
I've been involved with Mullum Creek for 15 years now. My early role was to help the Mathews with framing and presenting to Council an architectural and environmental vision for the project. In more recent years the team in my office has been working to support building and landscape designers engaged on the estate to achieve outcomes that are framed by this vision. A suite of far-reaching design and material guides that we've prepared for the project steer us in this task.



MULLUM CREEK

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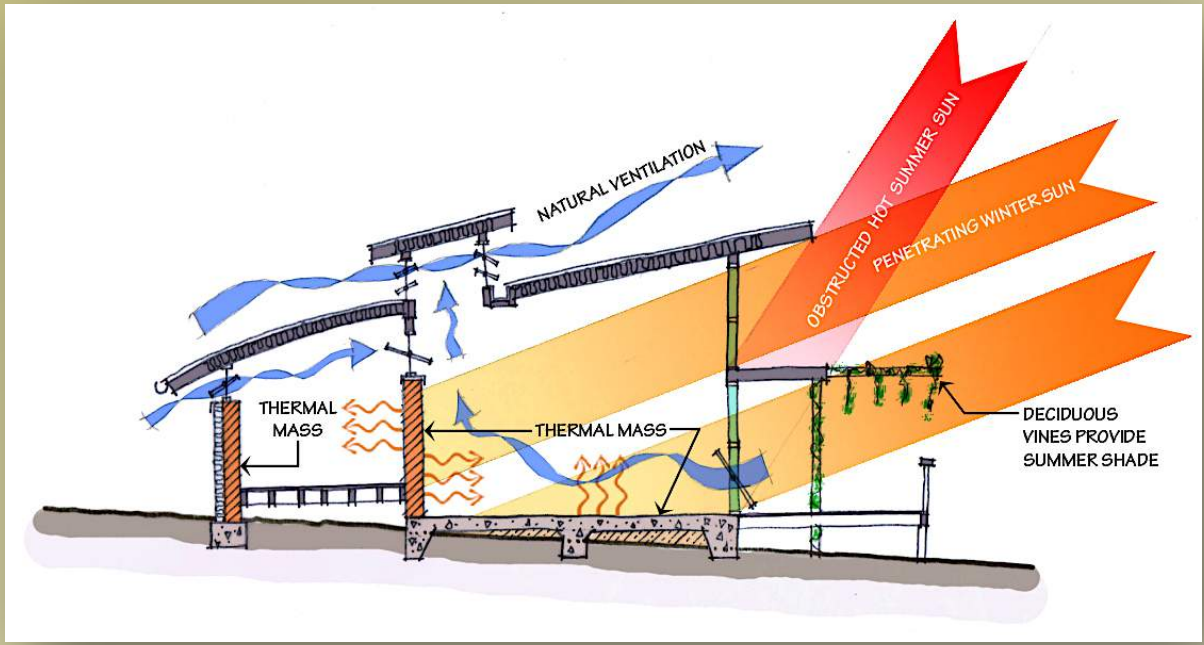
master plan

So Mullum Creek has applied a range of widely accepted environmental and social principles to achieve excellent and integrated design outcomes, not only for homes individually, but also on an estate-wide basis. It's applied all the obvious environmental design initiatives you will find in other eco-housing projects.

Almost half of the property, including the areas with the higher natural landscape values alongside Mullum Mullum Creek and the tributary that feeds it, has not been subdivided and rather donated to the public as a nature reserve. This reserve is now being enriched with sensitive landscape works that'll extend into residential streets.



min. 7.5 star energy rating

This predicts a 75MJ/m2/annum home heating and cooling load.

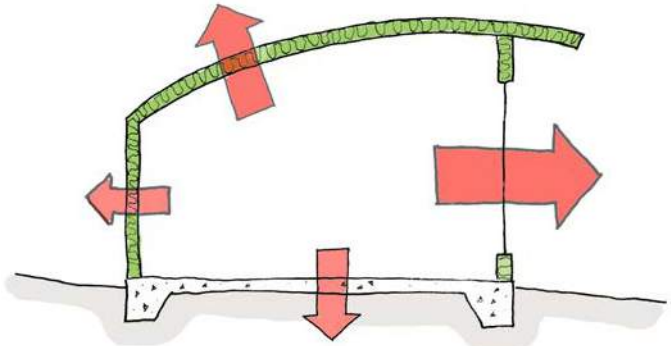
It represents a 67% energy saving
on regulation 6.0 star rating (125MJ/m2/annum).

All homes on the estate are required to have a minimum 7.5 star energy rating built into the fabric of the home. We require rooftop solar power installations of minimum 4kW generating capacity, and are finding that many home owners are keen to install larger systems of up to 20kW. And each home will have minimum 20kL rainwater storage capacity, for reuse in toilets, laundry and garden, and to ameliorate peak stormwater flows that would otherwise impact negatively on the Creek.

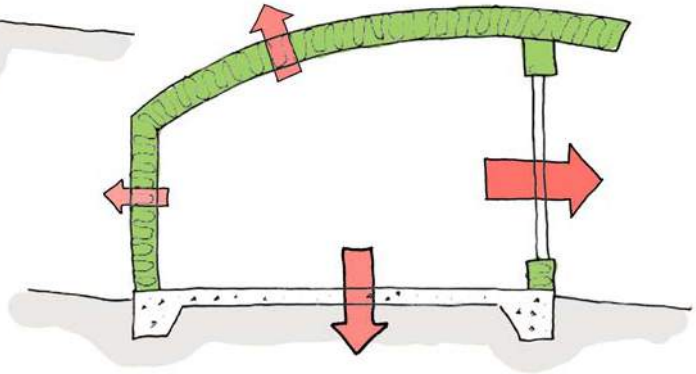
Mullum Creek is also working hard to address weaknesses in the implementation of some of these obvious eco-initiatives for housing development, and to advance more rigorous and holistic thinking in this regard. I find this aspect of the project to be particularly worthwhile for sharing through this presentation.

As confirmed by Swinburne University and sustainability consultants Pitt & Sherry a few years back, the value of Australia's home energy efficiency ratings is seriously eroded by lax and optimistic software data entry. And on site, material substitutions and poor construction detailing commonly reduce thermal performance further.

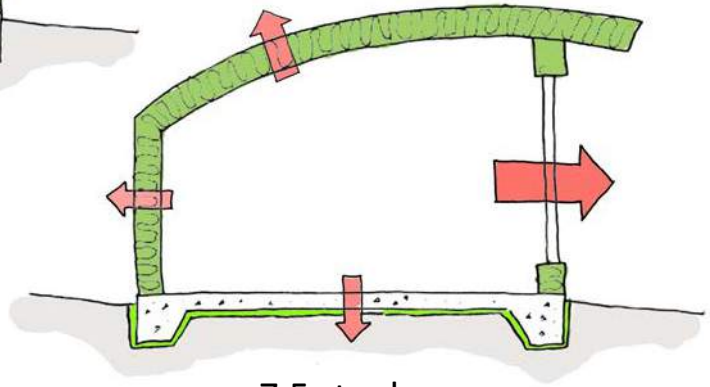
Mullum Creek pays for preliminary and certificate energy ratings of each home designed for the estate. It requires that all ratings be prepared by the one assessor Floyd Energy. Wayne Floyd is widely regarded as a leader in his field. Ratings are prepared at preliminary and developed schematic design stages to provide architects a heads-up, and us in the Design Review Committee the opportunity to offer expert advice towards optimising thermal performance. Final certificate ratings confirming our minimum 7.5 star performance also must be issued by our nominated assessor. This highly supported and tightly controlled process of energy rating ensures rigour, consistency and accountability.



6.0 star home
(125MJ/m2/annum)



6.8 star home
(98MJ/m2/annum)



7.5 star home
(75MJ/m2/annum)

NATIONWIDE HOUSE ENERGY RATING SCHEME ®

NatHERS

WINTER HEAT LOSS in cool temperate climate

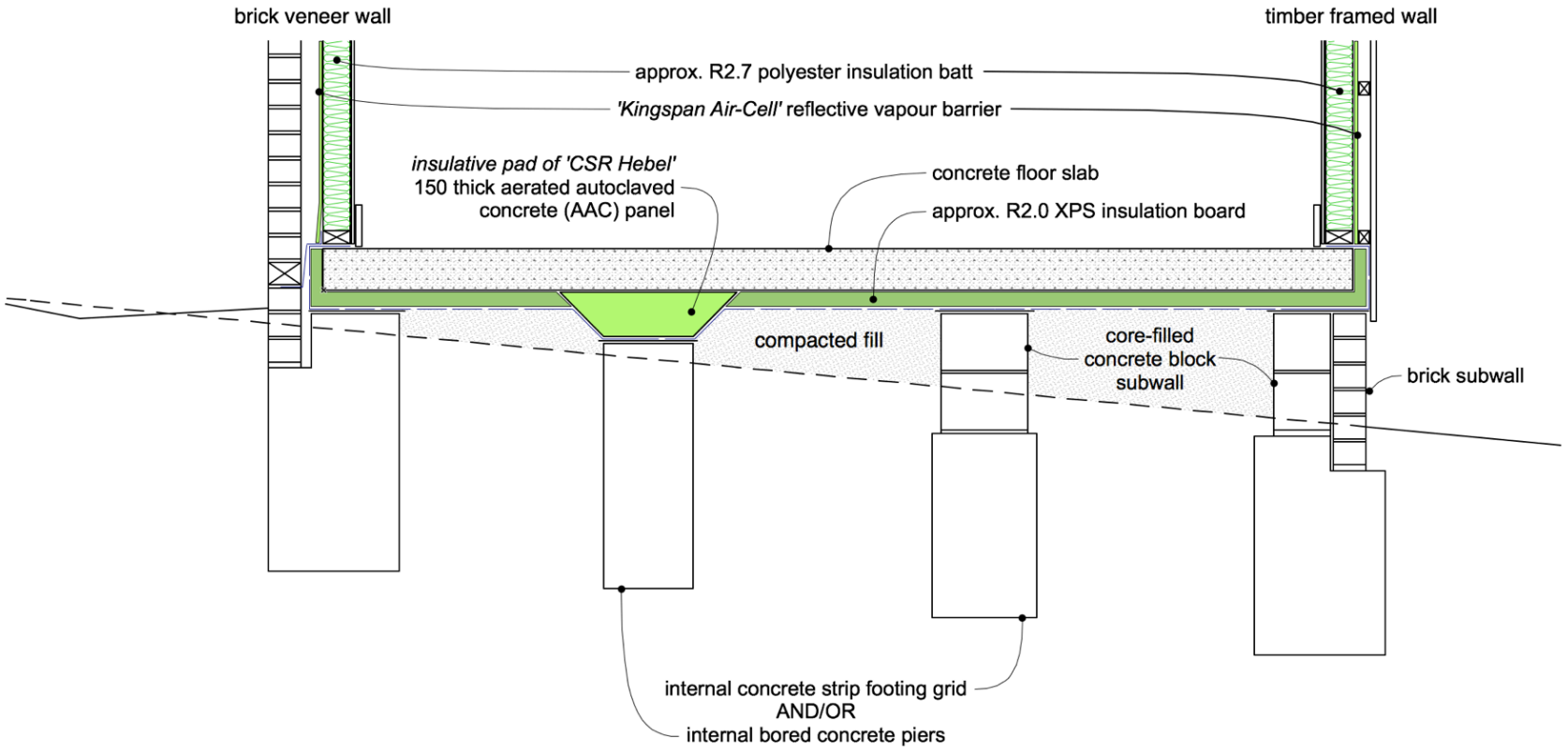
Achieving an independent and conservative 7.5 star thermal performance under NatHERS is not easy. We've found that homes with anything other than a compact architectural form and modest, well-oriented glazing, will really struggle to achieve 7.5 stars in our cool temperate climate, without all the following design features in place:

- high levels of insulation in external walls and roof/ceilings.
- double-glazed windows with high thermal resistance and solar heat gain co-efficient.

… and interestingly also …

- substantial and continuous insulation to lower floors.

GROUND SLAB INSULATION GUIDE



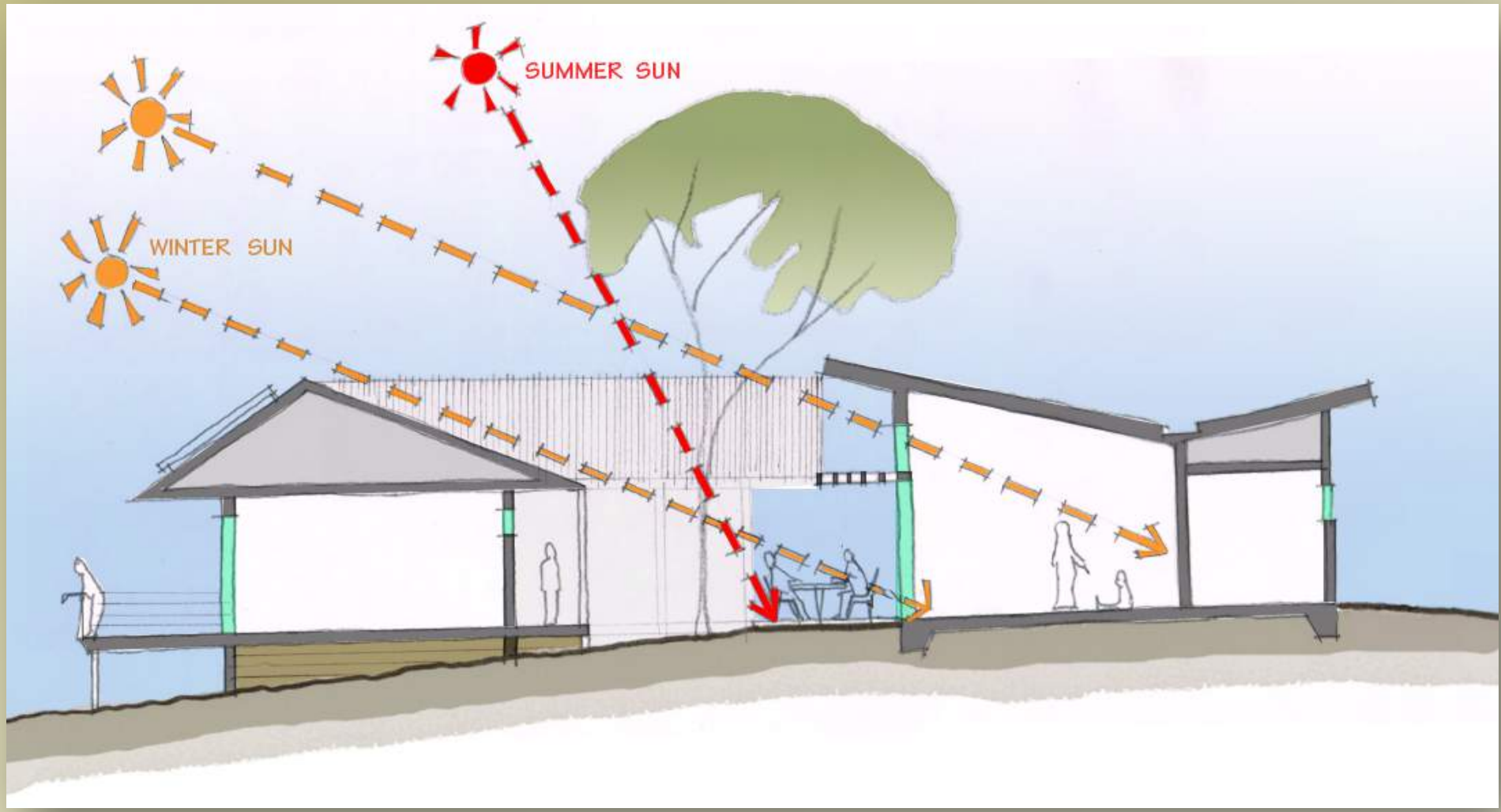
If lower floor insulation is removed from a typical 7.5 star Mullum Creek home, it'll commonly lose between 0.3 and 1.8 stars. Constructing an on-ground concrete floor with continuous under-slab insulation (to provide both good uninterrupted thermal resistance and internally accessible thermal mass) is challenging, potentially expensive and a practice generally unfamiliar to the Australian home building industry.

We acknowledge that home design and construction can voluntarily follow Passivhaus thermal performance standards and we have a few such homes proposed at Mullum Creek. They address air-tightness with much more rigour than homes assessed by the mandated NatHERS system. But neither Passivhaus or HatHERS address adequately wintertime thermal bridging between on-ground concrete floor slabs and blinding or piers, required on sites with slope and/or reactive soils.

If regulatory bodies wish to raise the thermal performance of new homes beyond the currently mandated 6 stars, they first need to advance to industry new solutions in design and construction detailing that'll tackle the weak links this raising of the bar will expose. Mullum Creek has advanced some solutions to this problem through its Ground Slab Insulation Guide.

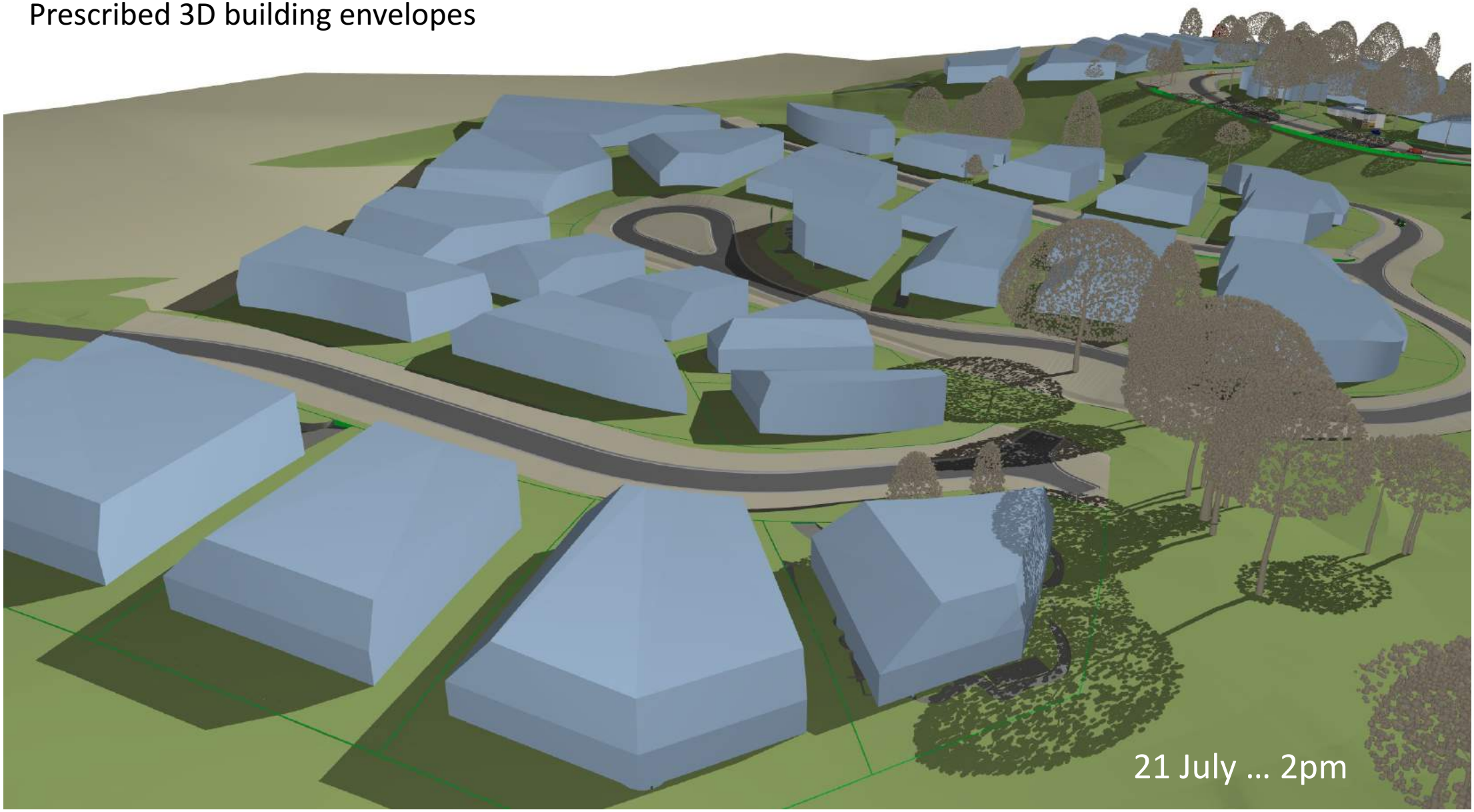
http://mullumcreek.com.au/app/uploads/Ground-Slab-Insulation-Guide.pdf

PRESERVING INTER-LOT SOLAR ACCESS required for 7.5 star energy rating and rooftop solar systems.



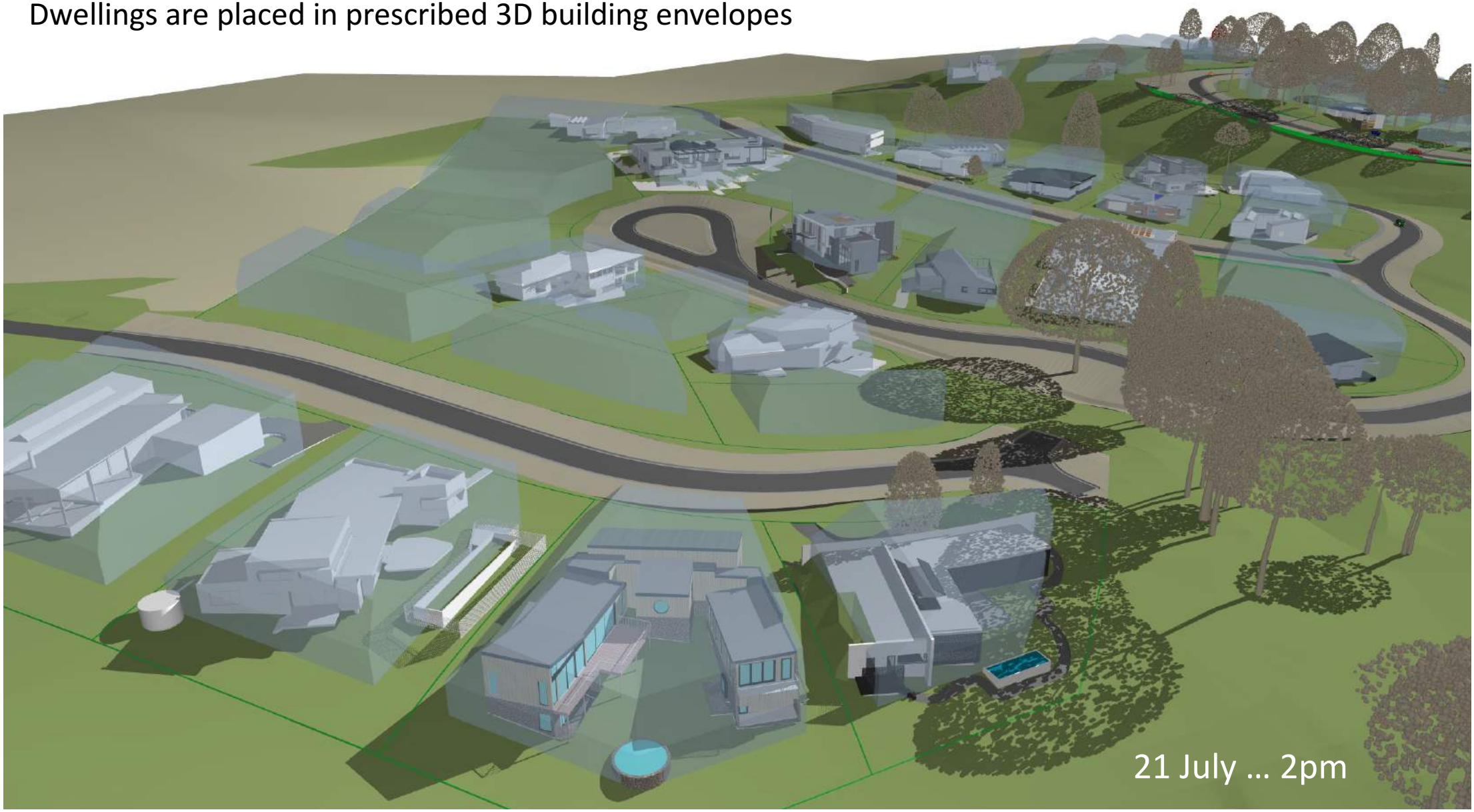
Unlike most other housing developments in Australia, Mullum Creek is mindful that high home energy ratings as well as rooftop solar power and hot water systems are crucially reliant on good access to low winter sunlight, and this can be severely impacted by surrounding structures and vegetation particularly to the north, and also to the east and west.

Prescribed 3D building envelopes



To that end, we've modelled and prescribed 3D building and vegetation envelopes, necessarily specific to each lot on this hilly estate, inside which all dwellings and new planted trees must be contained. These envelopes preserve full inter-lot solar access for each home, even in the depths of winter.

Dwellings are placed in prescribed 3D building envelopes

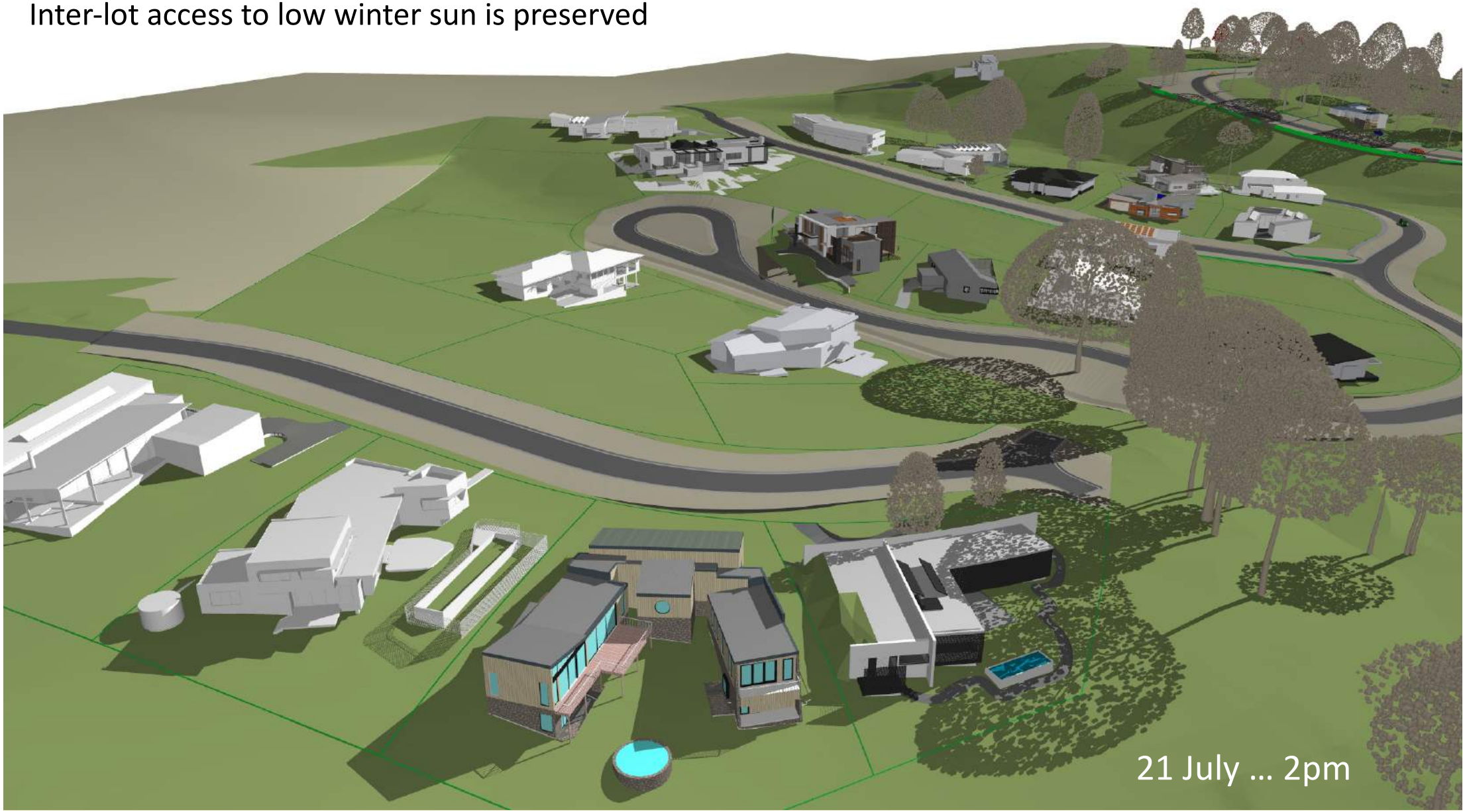


We check dwelling designs as they're reviewed for Mullum Creek schematic design approval, by simply placing dwelling forms as submitted to us into their prescribed envelopes on the terrain of our 3D CAD master file.

Envelope encroachment is easily identified

It's then very easy to identify where dwelling forms encroach their envelopes.

Inter-lot access to low winter sun is preserved



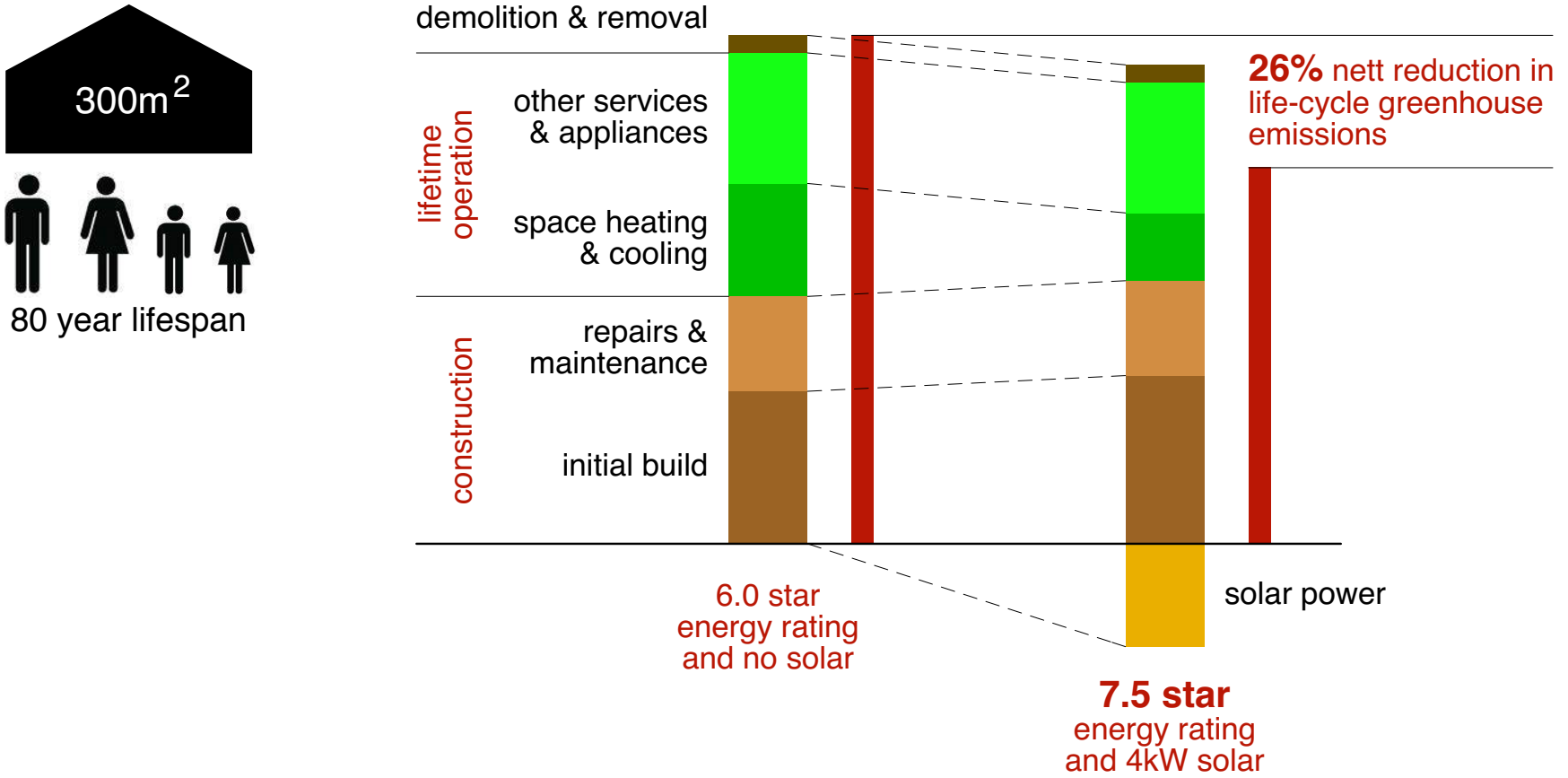
We regularly publish to the Mullum Creek website a BIMx viewer file or virtual navigation tool that provides everyone (lot owners and their architects, neighbours and council, web surfers and of course us as the Design Review Committee) a tool for exploring how all home designs on the estate are emerging, well ahead of construction commencing.

http://mullumcreek.com.au/mullum-creek-resources/virtual-estate-navigator/

View from Berrima Road entrance into Mullum Creek Estate

Through this file we're able to check the overshadowing effects of dwellings, existing trees and proposed vegetation, both within and between lots. We can also confirm view lines along streetscapes, into reserves and down to the creek.

Life cycle environmental impacts .... impacts *'from cradle to grave'*



References: Life cycle analysis of Mullum Creek home using eTool
A.Stephan, R.Crawford, 'House size matters'. Melbourne 2016

Per unit floor area, the energy requirement for heating and cooling a 7.5 star home at Mullum Creek will be low. What this means though is that the materials used to construct and maintain the home will remain as the primary driver, and will in fact increase as a proportion, of the overall life-cycle environmental impact. So that's the total of greenhouse gas emissions, resource depletion and biodiversity loss caused by the construction, lifetime operation and end-of-life demolition and disposal of a building - in other words the impacts *'from cradle to grave'*.

Mullum Creek didn't adopt a life-cycle approach to accounting for its environmental impacts, because available assessment tools for this purpose relied on assumptions which were not robust. But these tools will improve over time, and I encourage future developments to not lose sight of LCAs for the fullness and integrity they can offer.

That said, there remains an elephant in the room - our pervasive addiction to quantity over quality. Quality draws on human intelligence and craftsmanship. Quantity draws on finite natural resources. How much house is enough?

TIMBER PRODUCTS GUIDE

Explanation and principles underlying Guidelines Requirement R30

STEEL PRODUCTS GUIDE

Explanation and principles

CONCRETE & CEMENT PRODUCTS GUIDE

Explanation and principles

CLAY PRODUCTS GUIDE

Explanation and principles

What Mullum Creek has done towards reducing environmental impacts in construction is prepare Materials Guides to drive the selection of environmentally responsible building materials, and to apply these Guides either by formal requirement (in the case of timber and wet-mix concrete products) or by informal recommendation (as with steel and clay products).

http://mullumcreek.com.au/app/uploads/Timber-Products-Guide.pdf
http://mullumcreek.com.au/app/uploads/Steel-Products-Guide.pdf
http://mullumcreek.com.au/app/uploads/Concrete-Cement-Products-Guide.pdf
http://mullumcreek.com.au/app/uploads/Clay-Products-Guide.pdf

Cement and timber are two building materials which, if thoughtfully specified, can bring substantial environmental gain.

SCM concrete

25MPa on-ground house slab

Melton Library …… 40MPa precast wall panels

CERES Van Raay Centre 25MPa coloured concrete paving

The manufacture of common Portland cement currently accounts for a staggering 6-7% of our planet's anthropogenic greenhouse gas emissions. Yet there are alternative, equally suitable and readily available concrete binders such as fly ash (waste from coal fired power generation) and slag (a by-product from steel smelting). Such alternative binders are referred to as '*supplementary cementitious materials*' or '*SCMs*'. We're requiring that SCMs make up a minimum 30% of the cement used in wet mix structural concrete laid at Mullum Creek. And some lot owners and builders have chosen to increase this ratio significantly where surface finish is not critical (so for in-ground concrete elements such as retaining walls, blinding, piers, strip and pad footings).

http://mullumcreek.com.au/app/uploads/Concrete-Cement-Products-Guide.pdf

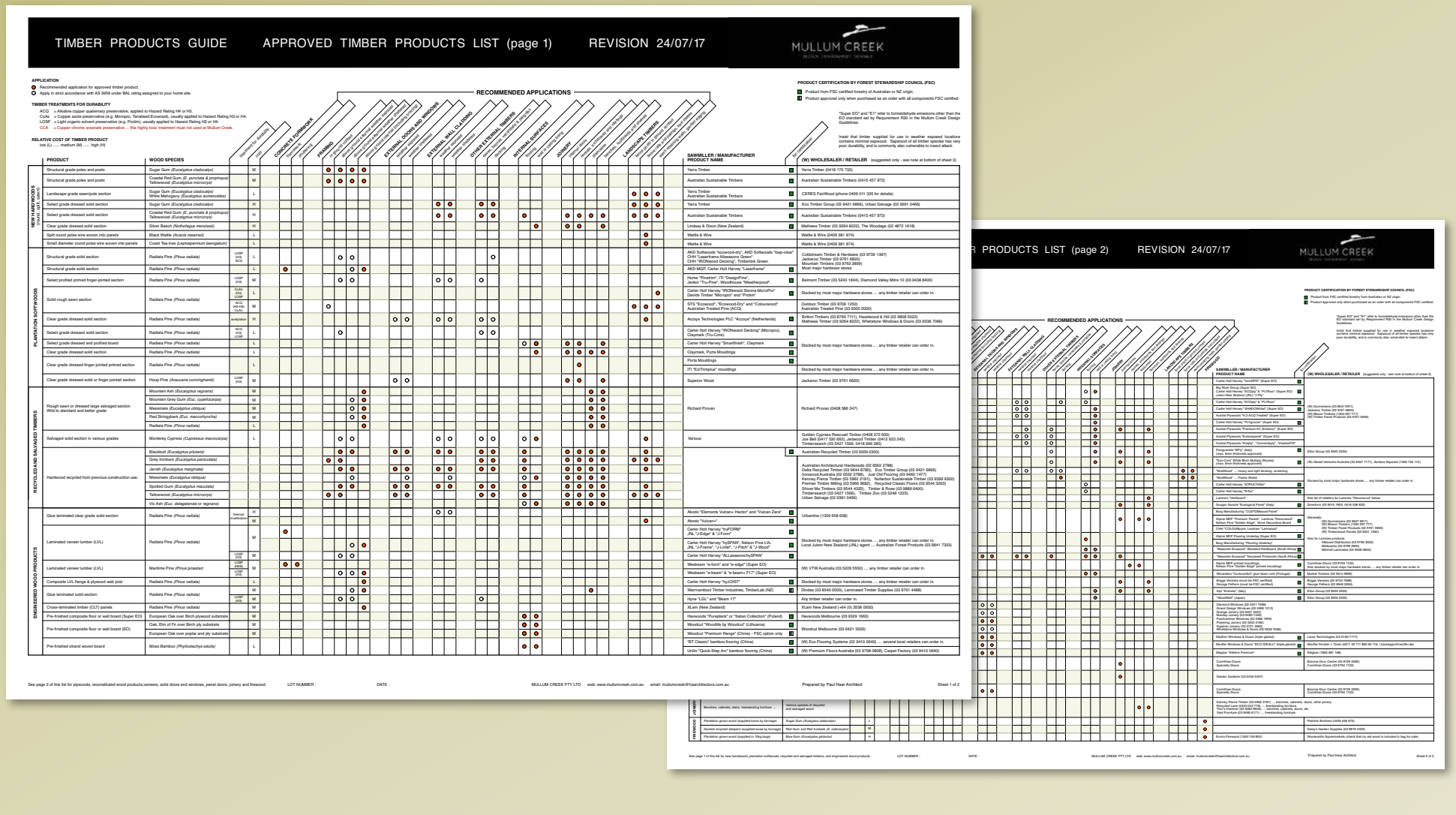
Agroforestry … Bambra VICTORIA

On-farm plantation forestry … Lismore VICTORIA

Clear-felled native forest … The Styx TASMANIA

Clear-felled native forest … PERU

Contrary to popular belief and some heavy marketing, timber can be the very best or the very worst building material you might work with, depending on where and how it's sourced. It can be harvested from deliberately planted and/or sensitively managed forest, helping to maintain healthy ecological processes, sequestering atmospheric carbon, and contributing to the social and economic well-being of rural communities. Timber harvested insensitively can result in serious and irreversible impacts on flora and fauna, soil health and waterways. It can reduce or even reverse a forest system's ability to sequester atmospheric carbon. And it can erode the well-being of rural communities.



Mullum Creek requires that timbers be sourced sustainably in accordance with quite stringent criteria. We've prepared a Timber Products Guide with a comprehensive list of readily available timbers suited to all applications and budgets.

http://mullumcreek.com.au/app/uploads/Timber-Products-Guide.pdf

This list, the only one of its kind current in Australia, is regularly updated. We're really pleased and a little surprised with how most lot owners, architects and builders are with minimal resistance embracing the sustainable timber products we're requiring them to choose from. And we believe they'll carry this new product awareness to their other project work.






CERES Fair Wood

sourcing environmentally and socially responsible timber

This Mullum Creek initiative has also advanced new and more environmentally responsible timber supply lines. One of these is CERES FairWood, a new social enterprise and business arm of Melbourne's much loved CERES Community Environment Park. FairWood is about to begin retailing to the green demographic environmentally and socially responsible timbers sourced from small farm foresters and salvage sawmillers who otherwise struggle to access a substantial and appreciative market for their sustainable produce.

SITE AND WASTE MANAGEMENT GUIDE

for builders at Mullum Creek

42% of all waste to landfill in Australia is construction waste. When we first looked at how best to approach this subject at Mullum Creek, we were surprised by the absence of a hands-on manual to help builders reduce and recycle waste. Our Site and Waste Management Guide includes requirements and recommendations that are now being successfully addressed on the estate. It makes a real and practical contribution to sustainable building.

http://mullumcreek.com.au/app/uploads/Waste-Management-Guide.pdf

Another terrific initiative of the Mullum Creek project is its design incentive package. Twenty-seven architects and building designers, who do beautiful work and have fine environmental cred, are introduced to lot owners via links on our website.

http://mullumcreek.com.au/designers/architects-building-designers/

Lot 32 …. Steffen Welsch Architects

Where one of these designers is selected by a lot owner, the designer receives a very generous allowance from Mullum Creek to prepare, in close consultation with the owner, a preliminary design that is consistent with the requirements of the Mullum Creek Design Guidelines.

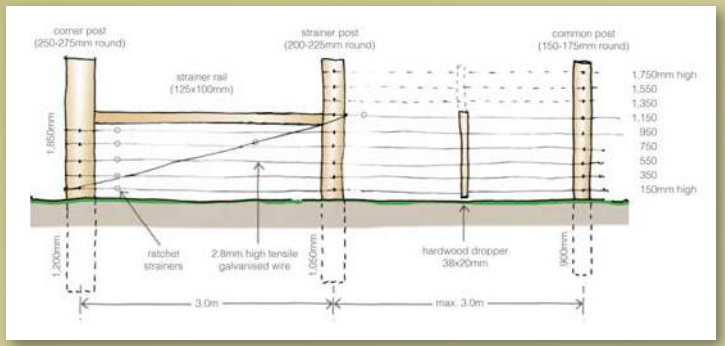
Lot 56 …. Maxa Design

This initiative has proven very popular and successful because it exposes the prospective Mullum Creek community to, and sets a high standard for, environmentally sensitive architectural design across the estate.

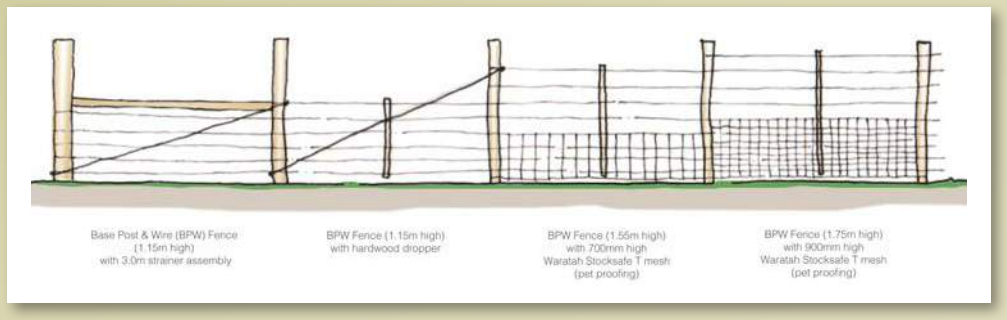
And once a home is under construction, Mullum Creek provides a free inspection service, to ensure that environmentally sensitive materials and good thermal performance designed into the home are carried through to the final constructed outcome.

To help extend Mullum Creek's rural-bush aesthetic into the yards of residential lots, the developer has also offered home owners financial incentives to engage landscape architects, who in turn we have pre-selected for their expertise in native landscape systems and productive food gardening. These designers have undertaken to design according to the Mullum Creek Design Guidelines and to promote the values of the project in their work on the estate.

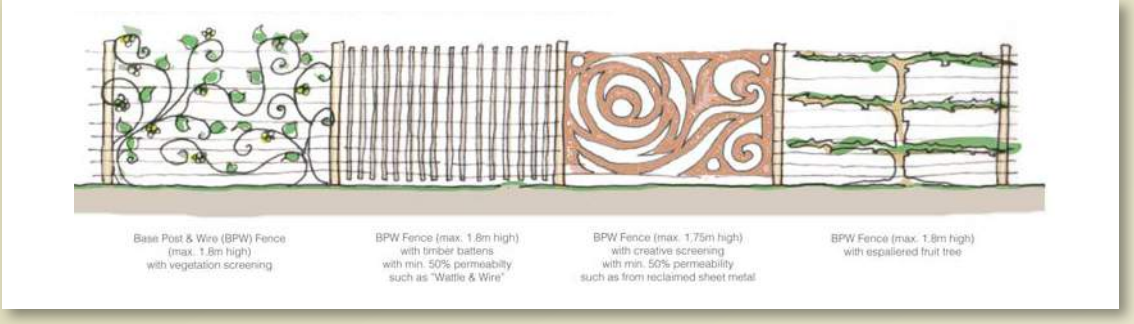
http://mullumcreek.com.au/designers/landscape-architects/



Base post and wire fence



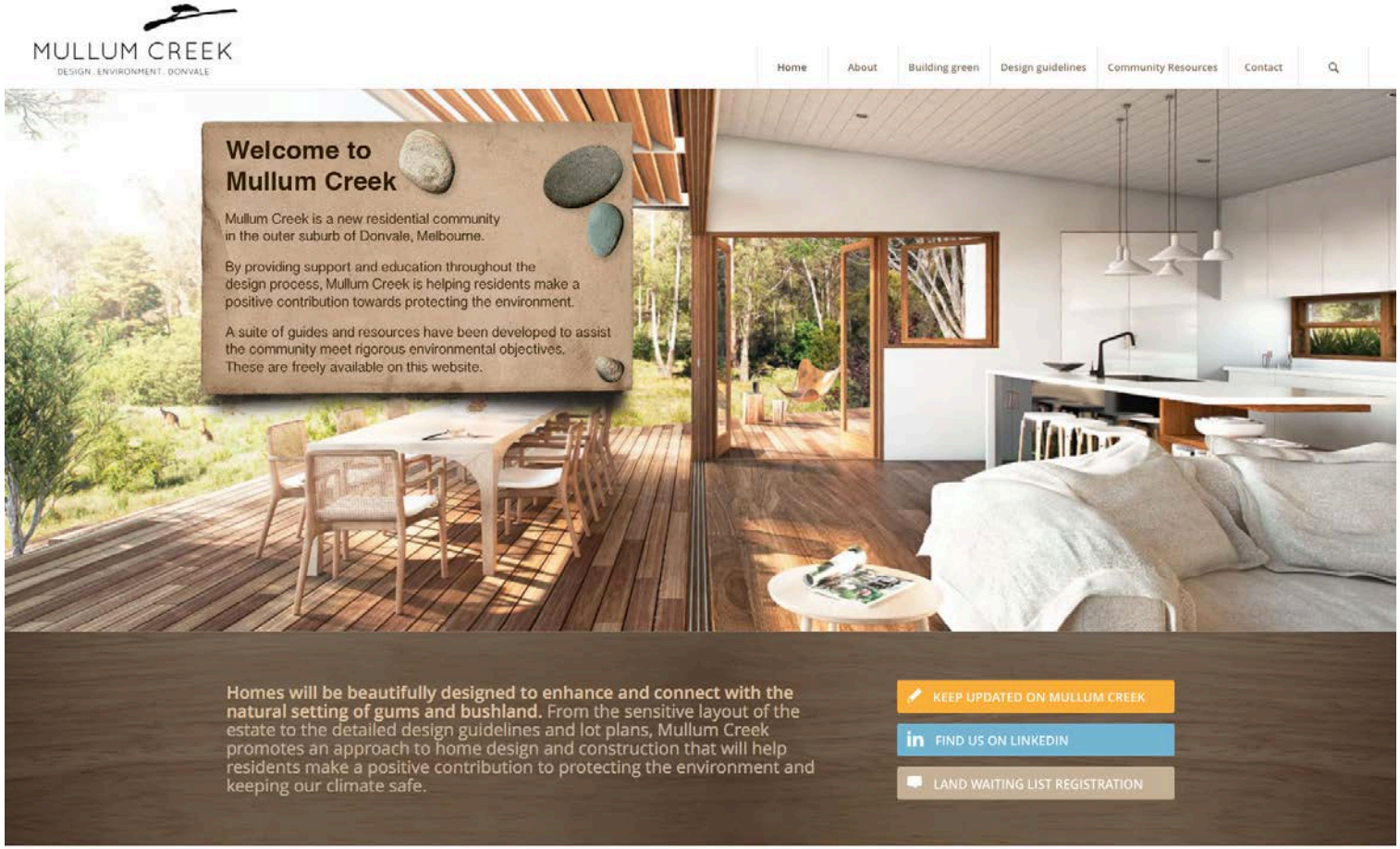
Base post and wire fence with options for kid and animal containment



Base post and wire fence with examples of screening (minimum 50% permeable)

Mullum Creek also requires that inter-lot fencing be constrained. It's avoided forward of the dwelling's street façade, and elsewhere it's restricted to an open rural post-and-wire style. This ensures that the open, expansive rural feel of the Mullum Creek landscape is retained.

http://mullumcreek.com.au/app/uploads/Fencing-Guide.pdf



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Mullum Creek will be a beautiful and environmentally responsible residential development once it's fully completed. And even more valuable will be its legacy for learning. The Mullum Creek website shares our story - our vision and objectives, project framework and environmental initiatives, design guides and technical notes, and review procedures. These resources are all freely available on the website and we hope they contribute to the knowledge base for more sustainable living in suburban and peri-urban settings.