# Baugruppen Project - Lot 2 @ WGV

## One Planet Living Response Matrix

Version: December 2016

One Planet Living (OPL) is a sustainability framework developed for the BedZed project in Beddington England, now applied globally, with a set of principles intended to guide development towards a sustainable approach that operates within the acknowledged resource limitation of the single planet available. This project may elect to seek endorsement under the OPL framework or simply use the principles and benchmarks as design guidelines. Regardless, the 10 Principles of OPL are a good basis for a sustainability strategy.

The energy philosophy relies on a high-quality build that is well sealed (achieving blower test results far superior to typical Perth build) and insulated, but able to be opened to the favourable climatic conditions that tend to prevail at the location near Fremantle. When the apartments are closed, a managed approach to fresh air supply enables energy to be reclaimed from the outgoing air stream. The same approach would be taken to reclaiming water heating energy. This approach is in line with the Passive House (Passivhaus) standard for energy performance. Complying in full with the Passivhaus standard would require some additional modelling and potentially have other design impacts that would need discussion with the project group.

There are some ideas here (that are marked 'TBC' in the table below) that could be part of the design discussion with the Building Group in each residential block, including:

- A trial year without air-conditioning, with the design such that installing a reverse cycle unit would be a simple retrofit.
- Hydronic floor heating – a luxurious heating method but possibly out-of-step with the low thermal mass approach. Energy efficiency would be inferior to reverse cycle a/c but could be comparable to gas space heating.
- A common laundry – this can enable lower cost energy and water initiatives, more simply managed by the strata group.
- Rain water harvesting could be installed by a single residential block, although the impact on the common area of above ground tanks would mean that costlier below ground storage would probably be employed.
- Greywater systems would be most effective if combined with a common laundry.

The table below shows how the project will respond to the 10 Principles of OPL.

| One Planet Living - Principles | Key Concepts (for discussion with the Building Group through design workshops) | Design Impacts | Performance Highlights |
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| Zero Carbon | **Low energy design:**<br>Climate responsive design integrates the solar passive design principles of good daylight and ventilation with the ultra-low energy philosophy of the international PassivHaus standard.<br>**Energy recovery:** when the apartments are closed, fresh air levels are maintained through a small mechanical unit that recaptures energy from the exiting air to temper incoming air. The quantity of air is small, making the units quiet and low energy. Additional heating is not generally required with such systems. Cooling relies on the climate and, in this location, a reliable evening sea breeze. Heat is also reclaimed from waste water stream to temper hot water system inlet stream.<br>**Reduced embodied carbon:**<br>The design approach favours insulation and building sealing over thermal mass, enabling high level of comfort with reduced need for thermal mass, reducing overall embodied emissions. | **Building sealing:** Passivhaus approach requires achieving ACH50 of less than 5. This is based on a post construction blower test and means that door and window seals need to be high performance and construction techniques need to consider sealing (typical Australian houses achieve ACH50 of 15 or worse).<br>**Cross ventilation**: when outdoor conditions are good, apartments can be opened and feature good cross ventilation. The makes the glazing specification more demanding by combining excellent thermal performance with excellent operability.<br>**Thermal performance**: Wall and roof construction achieving R5.0 or better. Thermally broken window frames with double or triple glazing (target <U1.0 system value for windows and external doors).<br>**Energy recovery:** a small fan driven heat exchange unit should be allowed for in each apartment, and ducting if required to closed spaces (allow for 100mm | **Building energy emissions reduced by at least 70% overall on a comparable, business-as-usual new build.**<br>Breakdown:<br>A lighter weight but very high performance construction method means that buildings can be open to the excellent local climate for most of the year, but can seal out the less favourable weather without needing energy for heating or cooling.<br>The approach relies less on thermal mass and more on intelligent use of air flows to move passive energy to where it is needed.<br>Heat/Cool - 90% less energy through building envelope design and heat reclaim. |



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| | **Low energy water sources:**<br>Irrigation water will be supplied at a lower embodied energy value than mains water through the community bore system.<br>**Renewable energy systems:**<br>Compact and multi-level buildings have relatively smaller solar collection areas to drive hot water and onsite energy generation systems. They should improve energy efficiency to make better use of the resource available. Battery storage can also help to optimise use of onsite renewable energy systems.<br>**Water heating:**<br>Water-heating system uses heat reclaimed from waste water stream to pre-heat incoming water supply.<br>A central heat pump and ring main (per residential block) provides the best overall energy performance.<br>TBC [Space heating could also take advantage of the hot water system but only makes economic sense if no cooling system is installed (i.e. no double up of a/c systems).] | diameter ducting). Allow for later addition of a heating/cooling unit and associated fan noise.<br>**Reduced embodied carbon**: Panel systems can achieve much lower carbon footprints than masonry - supplier dependent. WA concrete suppliers can provide 30% reduced Portland Cement mixes where concrete is the best solution.<br>**Renewable energy Systems**: The roof area, when shared with other uses such as shared greenspace, will not support enough PV to make a large impact. Some of the north facing façade may be able to support additional PV.<br>**Battery system:** A shared 15kWh system, per residential block, in plant area (2 small fridge sized units).<br>**Water heating**: A central plant area is required for a 300L storage tank and heat pump compressor (a typical large domestic unit (2m high by 1m radius). A riser is required to enable a ring main to deliver hot water and could also be used for air ducts. | Domestic Hot Water - 85% less energy demand by reclaiming heat from waste water and use of a central heat pump system.<br>Appliances and Lighting - 33% improvement in energy efficiency by making better off-the-shelf choices.<br>Space heating/cooling not expected to be required but design enables easy retrofit if required by including required electrical circuits and assigning a location. **Residents encouraged trial the first year without air-conditioning.** |
| Zero Waste | **Common services:**<br>A shared eco-laundry reduces the need for every apartment to have a laundry space, hence saving materials and adding design flexibility, further improving material efficiency.<br>**Construction waste:**<br>Waste is reduced dramatically with a prefabricated panel construction type. Any waste that is created at the factory or at the site will be recycled. Master Builders Smart Waste principles in place. | **C&D targets to be specified:**<br>**Waste production target:** <2.5kg per m2<br>**Landfill diversion target:** 90%<br>**MBA Smart Waste principles and reporting adhered to.**<br>**Operational waste**: Allow for multiple bins for separation (currently 2 streams in Fremantle) and space for composting/worm farm or other organics option (chickens? – assuming a resident takes ownership of them). | **Total waste to landfill less than 5%.**<br>**Organic waste managed on site in operation.** |
| Sustainable transport | **Transit oriented site:**<br>Cycle and pedestrian friendly design, direct connections to cycle path network, nearby bus route, potential for a car share point. | **Bicycle storage**: Weather proof bike storage provided. Ensure that majority of bike bays have a nearby GPO to charge electric bikes.<br>**Electric vehicles** are entering the mainstream. Speculative power supply to enable charging at min. 30% of bays (charge point installed by the residents when required).<br>**Car share point** as part of reduced parking provision. Car share point may feature an electric vehicle so allow for power supply of 40amps. | **Car free living is a viable option.**<br>Cycling facilities to complement the excellent location for cycle commuting.<br>The development also anticipates the mainstream arrival of **electric vehicles** and share car systems as the traditional idea of 'the car' recedes. |
| Sustainable Materials | **Material choices:**<br>Use of lightweight, sustainable materials in the fabrication of panel system.<br>**Use accredited products:**<br>A. Reused Products;<br>B. Recycled Content Products;<br>C. Environmental Product Declarations;<br>D. Third-Party Certification; or<br>E. Stewardship Programs.<br>**Materials Red List:**<br>Exclusion of all materials on the International Living Future Institute's 'Red List' (http://living-future.org/redlist)<br>**Climate responsive landscaping:**<br>Use of deciduous trees to achieve seasonal shading (rather than built elements). | **Materials specifications:**<br>FSC/PEFC timber **only** – this is no longer a special-order item.<br>'Best practice' PVC **only** – (as defined by the PVC Council) - this creates no limitations for trades.<br>[**Review Red-list** for any challenging items and consider specifying this list of materials as excluded from the works.] | Modern takes on natural materials to achieve **low energy, zero-toxicity and much reduced environmental impact** throughout the material lifecycle.<br>Landscape design that uses plants instead of built items wherever appropriate.<br>**TBC: Materials Red List:** independently verified list of building materials that are toxic, or for which there is mounting evidence of associated health risks. |
| Sustainable Food | **Balcony gardens:**<br>Residents will have the opportunity to garden on their own dedicated balcony space. These spaces are ideal for small scale food production.<br>**Landscape design:**<br>The landscape design for the site will include food producing plants, with an emphasis on popular, easy management species. | **Balconies and roof gardens** to support planters with approx. $2m^3$ soil. | **Fruit trees and large balconies and roof gardens** with ample planters. |

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| | **Organic waste stream managed onsite:**<br>The organic waste produced onsite will be composted and reused. | | |
| Sustainable Water | **Onsite infiltration:**<br>A simple and effective sustainable urban drainage approach, integrated with the landscape design.<br>**Low water plant selection:**<br>Water-wise tree, shrub, and lawn species.<br>**Use of Soil Amendment and Mulch:**<br>To improve the soil's water holding capacity.<br>**In-house Water Efficiency Design Measures:**<br>Efficiency well above building code requirements.<br>**TBC [Efficient irrigation system:**<br>An automatic, sub-soil irrigation system, supplied by grey water from the eco-laundry through a low-cost, low-maintenance diversion system.]<br>**TBC [Rain water harvesting:**<br>An underground tank to supply water for clothes washing and toilets.] | **WSUD:** integrated stormwater management and landscape design.<br>**Specify efficiency:** WELS ratings (within 1 star of following):<br>Fixture/Equipment Type WELS Rating<br>Taps 6 stars<br>Urinals 6 stars<br>Toilet 5 stars<br>Showers 3 stars (> 4.5 but <= 6.0)<br>Clothes Washing Machines 5 stars<br>Dishwashers 6 stars | **TBC [An eco-laundry that is supplied by rainwater** and sends waste water to irrigate the common landscaping.]<br>**Highly efficient water systems.** Residents have the option to install shared rain water systems to supply non-potable uses. |
| Land use & wildlife | **Tree retention:**<br>Keeping and supporting all healthy, existing species.<br>**Tree canopy target:**<br>Achieve 30% canopy cover within 10 years.<br>**Support fauna:**<br>Consider nesting boxes in larger trees.<br>**Land efficiency:**<br>Higher density, minimal car parking, retained deep root zone. | **Landscape design:** Allow for tree canopy to cover 30% of site.<br>Maximise **tree retention**. | **Tree canopy target 30%** within 10 years.<br>**Biophilic design** that provides habitat opportunities integrated with the built form and landscape. |
| Culture & community | **Neighbourliness:**<br>The combination of shared spaces and facilities, with a larger than typical provision of private outdoor space through large balconies, intends to strike a healthy balance between community and personal space. | **Balconies:** sense of ample private space to balance the shared aspect of the development. | **Healthy balance** of community and personal spaces. |
| Equity & Local Economy | **Ownership:**<br>Affordable, strata titled dwellings with private ownership of interior and exterior spaces and shared common property, allowing access to home ownership, in a desirable location, for those who might otherwise be excluded.<br>**Access:**<br>Incorporation of accessibility features into the structural design, such as wider doors and reduced thresholds, and allowances for the installation of optional accessibility aids. Apartments available that will be accessible without stairs.<br>**NBN access:**<br>Opportunities for microbusiness and working from home options. | **Accessibility:** min. 850mm door widths and other accessibility allowances for ground floor and lift accessible apartments.<br>Bathroom walls to enable easy retrofitting of hand rails. Step-less shower entry. | **Affordability \| Accessibility \| Connectivity**<br>Attractive dwelling and location, affordable design.<br>Apartments available that are accessible without stairs, and that meet the Liveable Housing Australia guidelines – gold level.<br>Work from home made easy with access to high speed NBN internet. |
| Health & Happiness | **Design fostering community:**<br>Well designed, attractive public spaces that encourage interaction and passive surveillance.<br>**Supportive neighbours:**<br>Having this kind of close-by peer support can be immensely helpful when people experience stressful periods that can impact on health and wellbeing. | **An unashamed respect for beauty** inherent in the project. | **Beautiful common spaces.** A secure but open lifestyle. |