Built Ecology™

Whiteside Street
ESD Strategy

Client

EGC Custodian Services Pty Ltd

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SBE1006700

EXECUTIVE SUMMARY

The residential sector in Australia directly accounts for approximately 17% of carbon emissions, while indirectly contributing to even more through resident transport/travel and food production. Water consumption in households accounts for around 11% of Australia's water use, while indirectly more water is consumed for gas and electricity supply and food production.

There are legislative requirements surrounding the development of new residential buildings which aim to reduce this impact on our environment. These include minimum requirements for water and energy efficiency under BASIX, and improvements to thermal comfort and residential amenity under both BASIX and SEPP 65.

This report outlines the ecologically sustainable development (ESD) opportunities which will be implemented at Whiteside Street to meet the minimum legislative requirements and also those initiatives which go beyond minimum compliance to showcase sustainability in a residential development.

ESD initiatives for the site include:

Water:

- Efficient Fixtures
- Rainwater collection for use in toilet flushing and irrigation
- Stormwater collection and treatment through water sensitive urban design
- Low water use vegetation

An investigation into water reuse opportunities demonstrated that the minimum compliance for water efficiency can be met through rainwater or stormwater collection with a 150kL storage tank. Rainwater recycling is capable of meeting 50% of the toilet and irrigation demand. Considerations include the requirement for minor treatment before use in toilet flushing and the space required for the storage tank.

Energy:

- Energy efficient appliances
- Energy efficient cooking appliances
- Reducing reliance on air conditioning through good passive design of the buildings, high levels of insulation, good shading and cross ventilation and installation of ceiling fans
- Demand reduction in common areas, with efficient lighting controls and minimal mechanical ventilation
- Providing stairwells in prominent locations adjacent to lifts to encourage their use. Naturally lighting and naturally ventilating these stairwells to reduce energy consumption and improve their amenity – increasing their use
- Efficient hot water systems such as gas instantaneous systems for each unit. More efficient centralised systems will be investigated for feasibility in later stages of the project design.

The investigation found that a combination of energy efficiency measures in the public domain and dwelling design can achieve the minimum requirements of the legislation. A saving of approximately 20% of energy consumption can be achieved when compared to current practice. The feasibility of an on-site renewable energy system such as solar or wind power will also be investigated in later stages. This system would be used to power common area systems such as lighting and ventilation of the car park and corridors.

Materials:

The following materials initiatives will be investigated for incorporation within the development:

- At least 80% of construction and demolition waste will be reused or recycled
- Where possible, sustainable materials will be selected, such as concrete with a reduction in Portland cement, recycled steel, avoiding the use of environmentally damaging PVC products and recycled or sustainably sourced timber
- All paints, carpets, adhesives and sealants to have low VOC levels.

Transport

The site is located close to both the Macquarie University Station and the Macquarie Park train station. Therefore, to promote public transport use, safe and amenable walking paths will be provided to the boundary of the site. The project aims to connect these to improved walkways outside the site which will encourage pedestrian movement to the train station.

Further alternative forms of transport will be encouraged through the following:

- Providing bicycle parking spaces for each unit;
- Providing parking on site for small cars and motorcycles
- Providing parking spaces on site or at street level in front of the site, for the use of car share schemes.

Urban agriculture:

One of the biggest personal impacts a person can have on the environment is the consumption of food. This is because of the environmental degradation associated with both growing, harvesting and producing the food, but also the transport impacts from transporting the food from the place of production to the place of consumption. Therefore, significant environmental benefit is possible through home agriculture. Although the production is small, it assists to reduce greenhouse gas emissions associated with food transport.

Food production potential in unit blocks can be limited when the only outdoor space provided to occupants is the small balcony associated with the flat. This is being remedied in the Whiteside Street development through provision of apartment community garden to enable occupants to plant and grow their own vegies.

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Issue/Status	Revision	Date Issued	Author	Checked	Approved	Comment
Draft		20 December 2010	DV	KWF	KWF	
Final		14 January 2011	DV	KWF	KWF	
DRAFT	A	24TH May 2011	IS			Based on Updated Concept – For Comment
FINAL	A	26th May 2011	IS		AMD	FINAL

1 Introduction

The Whiteside project is a residential development in North Ryde, located on Whiteside Street. The site is bound by Epping Road to the north and Whiteside Street to the west. Approximately 213 dwellings are proposed, as a mix of 1, 2 and 3 bedroom units located in 4 separate buildings.

There are a number of design initiatives available for the site to improve the sustainability of the project. These fall under the following categories:

- Water use
- Energy consumption
- Materials
- Transport
- Urban agriculture

1.1 Applicable Sustainable Planning Instruments

The development design will be governed by the following planning instruments which are aimed at improving residential sustainability and amenity:

- SEPP 65
- The BCA 2010
- BASIX – Building Sustainability Index

This report identifies site infrastructure opportunities which will assist the development with achieving the requirements under these instruments.

1.2 Environmental Sustainability

When assessing the options available for the site, it is important to evaluate which initiatives will enable the project to meet minimum requirements of the legislation, however, it is also important to evaluate which initiatives will have the highest environmental outcome. Therefore, each initiative has been evaluated in terms of:

- Ability to meet minimum compliance
- Environmental Benefit
- Economic feasibility

1.3 Sources of Information

In the collation of this report the following sources of information were used:

- Architectural drawings from SJB Architects, dated 17th May 2011
- The BASIX online tool and help notes: www.basix.nsw.gov.au

- National water commission, www.water.gov.au
- Department of Energy, Climate Change and Water, www.environment.nsw.gov.au
- NSW Government Department of Planning “Residential Flat Design Code”
- Built Ecology’s Water Tool 2008
- Energy Australia, www.energy.com.au
- Best Practice Guidelines for PVC in the Built Environment, PVC Expert Reference Panel, www.gbca.org.au

1.4 Limitations

The calculations which have been conducted at this stage are based on preliminary information only. The final systems and tank sizes will need to be confirmed once final unit mix and landscaped areas are known. The performance against the BASIX rating scheme cannot be confirmed until all inputs are known in detail.

2 Water Balance

The site is required to meet BASIX (Building Sustainability Index) water reduction benchmarks. For this development, this translates as a 40% reduction in potable water consumption over the current average.

The current average water consumption is equal to approximately 247L/person/day. This can be reduced through the adoption of water efficient fixtures, reducing water requirements for irrigation and alternative water sources for non-potable water uses such as toilet flushing, washing machines and irrigation.

The following section evaluates each of the options available for the site in terms of environmental performance, cost and maintenance.

2.1 Water Demand Reduction

The manner in which dwelling waste water and water supply is treated is a significant aspect of both the site-wide and dwelling sustainability strategy for Whiteside Street. In most developments, all water demands are met with the potable water supply. However, there are a number of supply alternatives that can greatly reduce a development's potable water consumption and some that can even reduce a development's sewage discharge.

The most important issue in water cycle management is firstly to reduce water demand as much as possible. This is achieved through design initiatives such as water efficient fittings and fixtures, low water demand landscape selection and efficient irrigation systems.

After demand has been minimised, the potential for supplying non-potable demands with non-potable sources is increased.

2.1.1 Efficient fittings

The table below represents standard and best practice fittings with relation to their WELS (Water Efficiency Labelling and Standards scheme) rating. A WELS rating is compulsory for all appliances and fittings sold in Australia. Currently, 6 star ratings are not available for all products in Australia, although some may be available at the time of fittings and fixtures selection. Recommendations have been provided below which take into consideration the water saving potential as well as the availability of a variety of products to ensure practicality of application.

	Current Practice	Whiteside Street Best Practice
Toilets	2 Star WELS rated toilets	4 Star WELS rated toilets or better
Hand Basins/ Sinks	3 Star WELS rated taps	6 Star WELS rated taps
Showers	2 Star WELS showerheads	3 Star WELS showerheads or better
Dishwashers	2 Star WELS dishwashers	4 Star WELS dishwashers
Washing machines	2 Star WELS washing machines or better	4 Star WELS washing machines or better
Irrigation	Spray irrigation/no consideration for irrigation practice	Efficient subsoil drip irrigation
	No landscape or landscape that demands high water	Low water demand plants in landscaped areas

Table 1 - Standard and Best Practice Building Water Demand Strategies

Incorporating the above Best Practice options is the basis behind water efficient design. This reduces the water demand of the site, increasing the potential for non-potable uses to be supplied by alternative water sources.

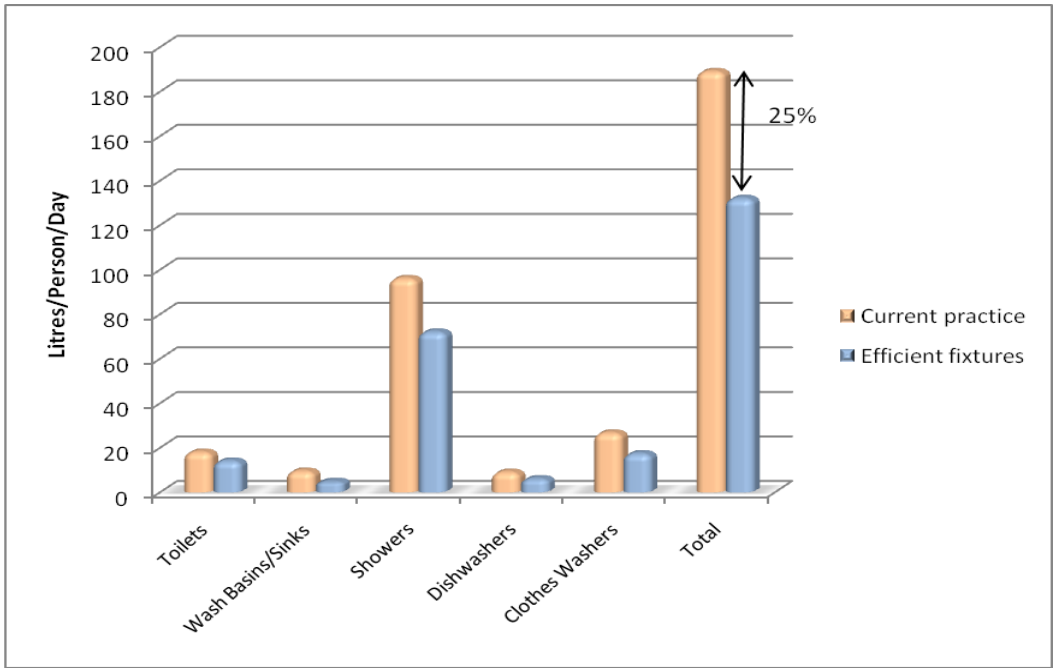

Figure 1: Water demand reduction through the use of efficient fixtures

It can be seen from the graph above that efficient fixtures have the potential to reduce potable water consumption by up to 25%. Therefore, further initiatives are required to meet BASIX minimum requirements.

2.1.2 Landscape Design

Further water savings can be achieved through water efficient landscape design such as Water Sensitive Urban Design (WSUD) and vegetation selection which prioritises plants with low or no watering requirement.

Water sensitive urban design

WSUD is important for treatment/filtration of all stormwater and the avoidance of increasing stormwater flows for all events up to a 1-in-100-year average recurrence interval event. On site stormwater control is mandatory as per the Council requirements. Features of WSUD can be used to compliment the stormwater control strategy.

Initiatives to include in WSUD include:

- **Swales and bio retention swales** to improve infiltration and reduce runoff from the site. Swales also assist in natural filtration and treatment of stormwater before it enters natural water ways.
- **Gross pollutant traps** to prevent waterway pollution from large pieces of rubbish.
- **Porous paving and reduced paved areas** to reduce runoff from the site and increase infiltration
- **Retention basins/treatment pond/wetland** to ensure water is treated according to ANZECC guidelines for a three month average recurrence of storm events

Vegetation selection

The selection of species for gardens, street planting and public parks is important for reducing water consumption in urban areas. Species should be selected that are low water use, and native to the area. Xeriscape gardening is a method of landscaping which use only species which are native to the area, so that the available rainfall is sufficient to meet their water requirements.

Through careful vegetation selection, irrigation requirements can be reduced by up to 80%. This can reduce the site potable water consumption by 5-10%.

Urban agriculture in the form of orchard tree plantings in the communal areas and private gardens is proposed for this site. These forms of vegetation require a much higher irrigation rate, however, the environmental benefits of the urban agriculture are considered to outweigh the irrigation needs, particularly if irrigation is being met by an alternative water source.

2.2 Rainwater Reuse

Current practice is to use Grade A water (rainwater, stormwater and recycled water) for non-potable uses only, such as toilet flushing, clothes washing and irrigation.

However, rainwater can be collected from roofs and the sides of buildings to be used as an alternative water source for non-potable uses. A benefit of using rainwater collection over similar alternatives is that rainwater does not necessarily require intensive processing prior to use. This is due to the fact that it is collected from relatively clean surfaces. However, a disadvantage is that the irregularity of rainfall often means that large scale tanks are required to adequately supply intended end uses.

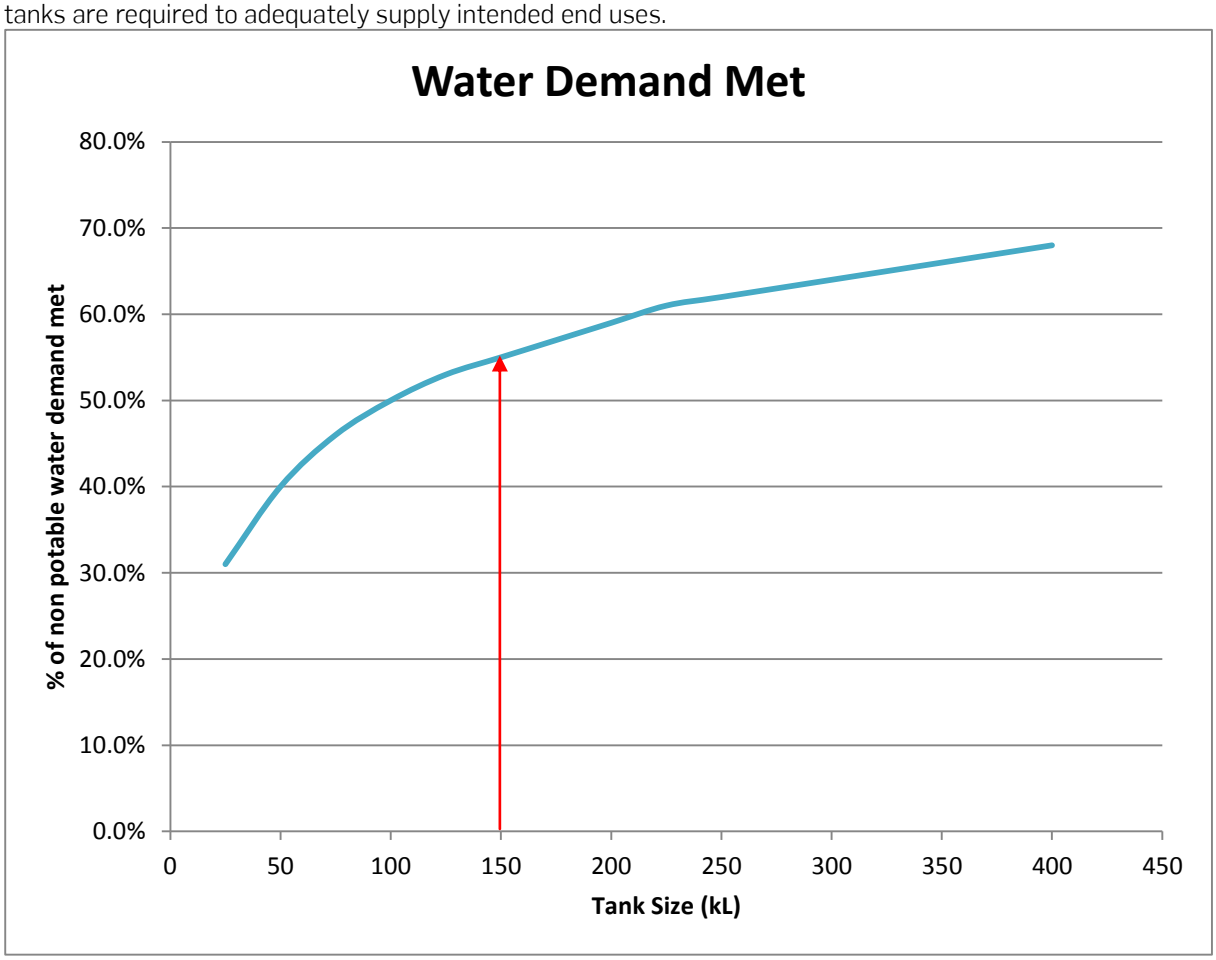

Figure 2: Non-potable demand met by rainwater[1]

Based on architectural drawings provided by SJB Architects, a rainwater tank of approximately 150m^3 would be able to meet the minimum requirements for BASIX. A tank of this size will need to be connected to at least 50% of the units for toilet flushing and will also need to provide for irrigation demands of the site. It is expected that a tank of this size will reduce the site-wide water consumption by a further 50% on top of the reduction achieved by efficient fixtures and water efficient landscaping. The exact size and detailed design of rainwater collection system will be clarified as the design progresses.

The above graph demonstrates that increasing the tank size does not give an equivalent increase in non-potable demand met. The optimal tank size is considered to be the point at which increasing the tank size further does not provide a significant increase in demand met.

[1] Based on an irrigation area of 4,860m^2, and roof catchment area of 6,082m^2 with 4 star rated toilets and 0.58L/m^2 for irrigation.

For the rainwater tank, the optimal size is around 150kL. This is sufficient to meet BASIX minimum requirements. There is no significant environmental benefit from going beyond this minimum requirement.

The following graph demonstrates how the above strategies can reduced the per capita water demand (not including irrigation) below the current practice.

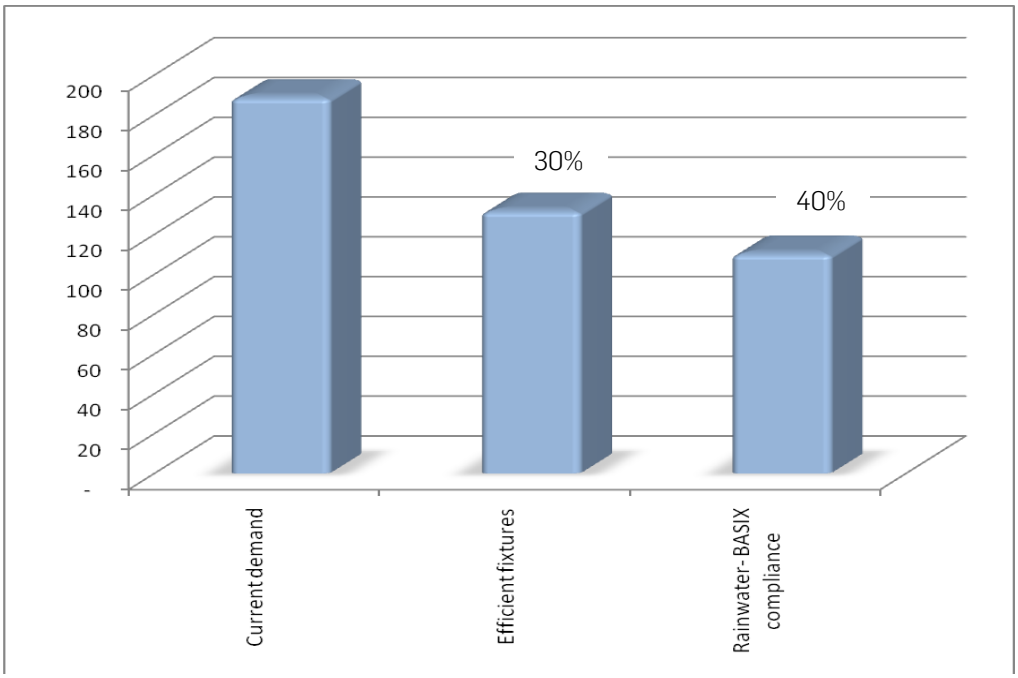

Figure 3: Percentage reduction in potable water consumption

To improve water efficiency beyond minimum compliance, a recycled wastewater system would be required. This system would collect either greywater or blackwater from the building to a centralised treatment system, then recirculate treated wastewater back to the buildings for toilet flushing and irrigation needs. The quantity of water available through such a system is much greater than that available by rainwater collection, therefore a higher water score can be expected in BASIX.

The feasibility for installing such a system in Whiteside will be investigated in later stages of the building design.

2.3 Summary

The following initiatives will be implemented at Whiteside Street to improve the water efficiency of the site:

- Efficient fixtures – toilets, taps and showers as listed above
- Water sensitive urban design with stormwater treatment and retention
- Low-water use landscaping
- A rainwater tank of approximately 150kL to provide water for flushing to at least 50% of the dwellings toilets and providing water for irrigation.

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3 Energy Use Reduction

3.1 Legislative Requirements

The site is required to meet BASIX energy reduction benchmarks. For this site, this translates as a 20% reduction in energy consumption over the current average.

The BASIX tool includes energy consumption expected from appliances, air conditioning, hot water systems and common area uses such as lighting and ventilation. The design of the dwellings impact on the energy score by the expected thermal comfort in the space. A well designed unit with good thermal comfort prediction is expected to use less air conditioning, and therefore will score better in BASIX.

Additionally, the buildings must meet SEPP 65 compliance. Relevant to energy efficiency is the Building Amenity section of the Residential Flat Design Code which stipulates the following initiatives:

- 70% of apartments should receive a minimum of 3 hours direct sunlight between 9am and 3pm in mid-winter;
- No more than 10% of the apartments should have a southerly aspect;
- Building depths should not exceed 18m;
- 60% of residential units should be naturally cross ventilated; and
- 25% of kitchens should have access to natural ventilation

Each of the initiatives above improves indoor environment quality and reduces reliance on artificial heating, cooling and lighting. By complying with the Residential Flat Design Code best practice initiatives, the site will comply with SEPP 65 requirements and improve the energy efficiency of the dwellings.

3.2 Energy Demand Reduction Strategies

Energy consumption on site is within two separate areas – the common areas and the individual dwellings. Opportunities exist for both areas to reduce the overall energy consumption on site. These are discussed below.

3.2.1 Common areas

Common area energy consumption is predominantly made up of the following items in the Whiteside Street development:

- Car park ventilation and lighting
- Common area ventilation and lighting
- Lifts

The biggest impact on common area energy consumption can be achieved by having an outdoor, naturally lit and ventilated car park. However, on a site such as this, it is not practical. Therefore, other initiatives will be investigated to reduce energy consumption:

- Carbon monoxide sensors in the car park to control the ventilation. This will reduce unnecessary operation of the ventilation system while maintaining appropriate levels of air quality;

- Access to natural ventilation where possible – providing ventilation grills to underground areas, etc. This natural ventilation strategy will be employed in the portion of the car park that is located above ground level;
- Reduced lighting power density to maintain only the minimum compliance levels. This reduces unnecessary lighting energy;
- Energy efficient light fittings;
- Daylight sensors on lighting in entry areas to reduce lighting where sufficient daylight is available;
- Variable speed drive fans on the ventilation supply and exhaust to reduce energy demand;
- High efficiency light fittings

Lighting in the lobby and common hallway areas will be controlled by motion sensor to ensure no waste of lighting energy consumption.

Finally, high energy savings can be experienced through reduced lift traffic. Being up to 9 stories, lifts will be required; however, their use is reduced by encouraging the use of stairs. Stairway use is promoted through:

- Prominently located stairways,
- Having an abundance of natural light in the stairwell, complemented by good night time lighting;
- Natural ventilation in the stairwell.

By implementing the above initiatives, there is the potential for the site to make energy savings of up to 10-15%

3.2.2 Dwelling Energy Reduction

The site is required to meet BASIX minimum requirements by reducing energy consumption by 20%. This can be achieved through the use of basic energy efficient strategies and good passive design. Mechanisms by which the building will reduce energy consumption include:

- Good passive design of the buildings – this will take into account Section J and SEPP 65 requirements;
- Energy efficient appliances and equipment and services; and
- Energy efficient water heating options.

Energy Australia suggests that the typical household energy consumption is broken down as shown in the following pie chart. The initiatives discussed below aim to remove pieces of energy consumption from the pie.

Within the residential apartments, additional energy efficiency measures include improving the efficiency of the hot water system, Increasing the efficiency of appliances and air conditioning systems and improving passive design of the dwellings.

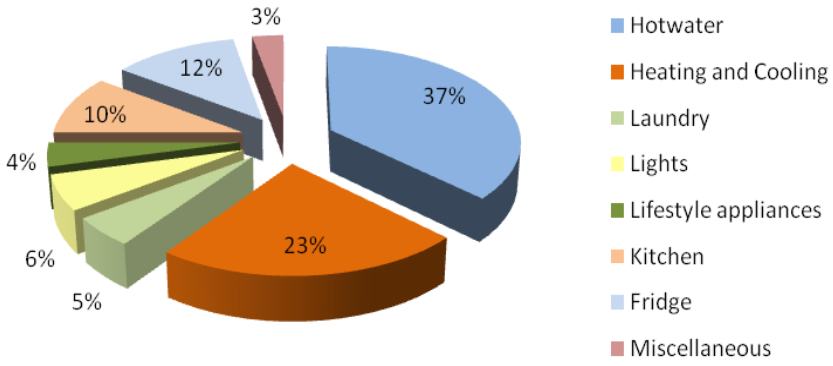

Figure 4: Average household energy consumption from different uses.

Passive Design:

Heating and cooling can account for up to 23% of a household's energy consumption. This can be dramatically reduced through good passive design of the dwellings. Good passive design in residential dwellings increases thermal comfort and therefore reduces reliance on artificial heating and cooling. Passive design measures include:

- Insulation – Roof R-value of 3.2, external wall R-value of 2.8 based on BCA 2010 requirements
- Good daylight availability – maximising the use of windows on the northern facade
- Well-designed shading – reducing windows on east and west orientations which are difficult to shade, horizontal shading devices or eaves on northern facades
- Good natural ventilation – openings on at least two sides to provide good cross ventilation. Windows on opposite sides provide the best thermal result.

By meeting SEPP 65 and BCA 2010 requirements, the performance of the buildings will be improved. The detailed design stage of this project will allow for more comprehensive passive design to optimise energy efficiency of the dwellings.

Hot water

Domestic hot water can account for up to 37% of a household energy bill. Using gas instantaneous hot water systems is a simple and reasonably efficient method of achieving improved performance in water heating. The site will also investigate further energy efficient hot water options during the detailed design stage. These include options such as a centralised heat pump and gas powered solar hot water.

Reliability of hot water supply is a common concern with solar hot water systems, particularly for cloudy/rainy days. Installing a system that is gas boosted will supplement hot water supply, ensuring availability on cloudy days. In a climate like Sydney's, solar hot water can be expected to provide a significant proportion of the hot water demand, dramatically reducing the size of the energy pie.

A centralised hot water system also allows for increased efficiency. If sufficient roof area is not available for the application of solar hot water, the demand can be supplemented with an efficient central system such as an electric heat pump or instantaneous gas water heater.

Appliances:

Appliances which will be supplied to the apartments include cook tops and ovens, dishwashers and dryers. By installing gas cook tops and 4 Star dishwashers and dryers, the potential energy score will be increased.

A significant energy saving can be achieved by placing fridges in well ventilated fridge spaces. This requires that

(i) the refrigerator will be unenclosed; or

(ii) the refrigerator will only be enclosed on three sides, including the rear and top; or

(iii) if the refrigerator is to be enclosed on three sides (not including the rear and top), ventilation grills are installed below the refrigerator (either in the floor underneath the refrigerant coils, from the rear, or within the plinth) and above the refrigerant coils, to allow air flow equal to the air flow that would pass over the refrigerant coils were the refrigerator unenclosed.

This is an architectural feature which will be considered during the detailed design of the dwelling layouts.

Air conditioning:

Reliance on air conditioning is significantly reduced through good passive design of the dwellings. This includes insulation, cross ventilation, good shading design and use of thermal mass. Air conditioning will be further reduced by providing ceiling fans in the apartments.

The development will be targeting a reduced reliance on air conditioning use through good passive design and ceiling fans where possible. If AC units are to be provided, they will have a high level of energy efficiency in accordance with Australian Standards.

Clothes Drying

Clothes dryers make up a large portion of a household's energy consumption, particularly in units where hanging space for clothes drying is limited.

By providing clothes drying lines either indoor or outdoor, an energy saving can be realised. Clothes drying lines will be provided for the units of the Whiteside Street development. Varieties which will be considered in the detailed design stage:

- Hanging lines over the bath
- A rack over the washing machine in the laundry
- A screened hanging box over the air conditioning unit on the balcony
- Retractable clothes lines in private courtyards

Each of the above options provides the potential for the household energy demand to be reduced as shown in the pie graph below.

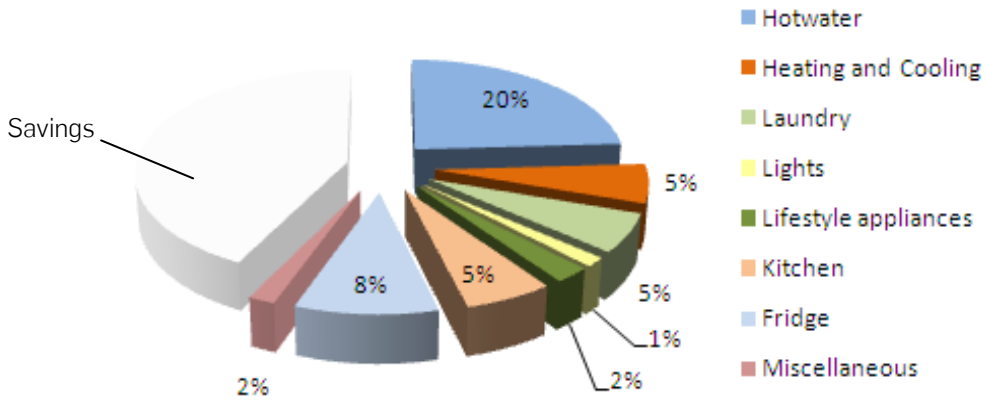

Figure 5: Potential energy demand savings for Whiteside Street

Renewable Energy Supply

The potential for providing an on-site renewable energy system such as solar or wind power will also be investigated in later stages. This system would be used to power common area systems such as lighting and ventilation of the car park and corridors.

4 Materials

Materials consumption causes significant damage to our environment. There are a number of initiatives that can be included in a residential development which can reduce this impact. This includes recycling of demolition and construction waste and selection of materials with a reduced environmental impact.

Material initiatives which will be considered during the detailed design stage of the development include;

- A target of 80% of construction and demolition waste to be reused or recycled. Waste facilities in Sydney commonly provide reuse and recycling options for all waste, this is to be targeted for this development.
- PVC use will be avoided, or where used, sustainable PVC materials should be selected. These PVC items should comply with the Best Practice Guidelines for PVC in the Built Environment.
- Timber should be selected from reused or recycled sources or be certified by an approved forestry management scheme such as FSC (Forestry Stewardship Council) or AFS (Australian Forestry Standard)
- Concrete should have reduced Portland cement content by replacing with industrial waste product
- Steel should meet steel strength grade requirements as detailed in the appendix
- All paints, carpets, adhesives and sealants should be selected with low VOC levels.

5 Transport

Both the director general's requirements and the Letter from the City of Ryde Council mention a need to reduce car-use dependency in the residential development.

Alternative forms of transport can be promoted in a number of ways in this development. The site is located close to the new Macquarie Park train station, as well as being on major bus routes and two arterial roads. Initiatives for alternative forms of transport are described below.

5.1 Public Transport

This site will become one of the closest residential developments to the Macquarie University Train Station and the Macquarie Park Train Station. This puts the project in an excellent location for public transport use.

Therefore, to promote public transport use, safe and amenable walking paths will be provided to the boundary of the site. The project aims to connect these to improved walkways outside the site which will encourage pedestrian movement to the train station.

Several bus routes also pass the site in multiple directions. Bus use will be promoted by the safe and amenable walking paths linked to public footpaths to the bus stops.

5.2 Cyclist facilities

In Sydney, approximately 40% of all car trips are a distance of 5km or less. Bicycle use for trips such as these will be promoted through provision of adequate cyclist facilities for occupiers and guests.

- Locked storage cages will be provided for each unit of a size that can contain a bicycle.
- Bicycle parking near the entrance of the development will promote bicycle use by visitors
- Safe and amenable bicycle paths to the boundary of the site should also be provided to encourage safe bike riding.

5.3 Car Share

Car sharing is a rental service intended to substitute for private vehicle ownership. Vehicles are provided by a car share company and rented by the hour for a fee paid to the car share company. These services are common in some European countries and are increasing in North America. By providing car share facilities in parking spaces on Whiteside Street, residents are provided with a practical alternative to owning a personal vehicle which they might normally use very infrequently. It also gives drivers an incentive to minimize their vehicle use and rely on other travel options as much as possible.

It has been found that car sharing typically reduces average vehicle use by 40-60% among drivers who rely on it, making it an important transportation demand management strategy.

The development should reach an agreement with Council whereby the car share spaces can be provided as street parking. This enables the facilities to be in a prominent location and allows the vehicles to be accessed by users who are not occupants of the development. The proximity of the development to Macquarie University suggests there may be many students in the area who would benefit from the availability of a car share scheme.

Car Share Companies

Car share programs are currently promoted in the City of Sydney CBD, with several cars available for lease parked in spaces around the inner city suburbs. There are currently 3 potential car share companies that could be involved:

- Charter drive www.charterdrive.com.au
- Flexicar - www.flexicar.com.au
- GoGet - www.goget.com.au

6 Urban Agriculture

Communal gardens, a form of urban agriculture, can result in many environmental benefits, the most significant of which is reduced food miles – reduced greenhouse gas emissions associated with transporting food from farm to table. One of the largest personal impacts an individual has on the environment can be the food and drink they consume. This is because of the environmental degradation associated with growing, harvesting and producing the food, and also the transport impacts from transporting the food. Therefore, providing space for residents to produce some of their own fruit and vegetables can have a significant positive impact on the environment.

Growing food and non-food crops in and near cities contributes to healthy communities by engaging residents in work and pleasure that improves the well-being of them and the broader public.

Urban gardens and farms produce surprising amounts of fruits and vegetables. In a 130-day growing season, a 10m^2 plot can provide most of a 4-person household's total yearly vegetable needs (Health Benefits of Urban Agriculture, Bellows et al). Urban gardens can also improve air quality, increase biodiversity and stabilise soils. Incorporating a compost system with these gardens will also reduce waste from neighbouring properties and provide a natural fertiliser for the gardens.

To promote urban agriculture in the Whiteside Street development, the following initiatives will be incorporated:

- Fruit tree plantings in the common gardens. These will be used as aesthetically pleasing, ornamental plantings which double as a productive food source for the residents;
- Provision of small garden plots to the apartments to enable occupants to plant and grow their own vegies.

Additionally, recycled water will be used to water the site landscaping. This provides additional environmental benefit by providing water collected on site to water gardens which provide food to the local residents.

7 Summary

Various sustainability initiatives will be included in the design of the Whiteside Street Development to improve the sustainability of the site. Initiatives have been evaluated which will assist the building in meeting minimum compliance requirements of BASIX and SEPP 65, as well as an evaluation on which initiatives can be included to improve the efficiency of the site beyond minimum compliance.

By including initiatives that take the buildings beyond minimum compliance, the development is providing itself with a point of difference which will have good marketing value and will demonstrate best practice and leadership in environmental design.

Water efficiency Strategies	
Water efficient fixtures and fittings – 6 star taps, 4 star toilets, 3 star showers, 4 star dishwashers and washing machines	
Low-water demand landscape species	
Rainwater tank of 150m^3 connected to a minimum of 50% of apartments for toilet flushing and supplying all irrigation needs	
Energy Efficiency Strategies	
Common area Initiatives	**Dwelling initiatives**
	Good levels of insulation to meet BCA 2010 requirements
Prominent and accessible common stairwells with natural ventilation and abundant natural light	Facing glazing predominantly in a northerly orientation to promote good solar control and passive solar heating for winter
	Cross ventilation to the majority of apartments to provide passive cooling in summer
Variable speed drive fans for all car park ventilation	Ceiling fans to promote low-energy cooling options
	Gas cook tops
Efficient compact fluorescent or LED lighting in dedicated fittings	3 Star dryers and 3.5 Star dishwashers
Central Hot Water System – Solar with support of heat pump and gas boost to be investigated during detailed design	Ventilated fridge space
	Indoor or outdoor clothes drying lines
	Efficient compact fluorescent or LED lighting in dedicated fittings
Materials Strategies	
80% of construction and demolition waste to be reused or recycled will be investigated	
PVC use should be avoided, or where used, sustainable PVC materials should be selected. Substitution of PVC	

will be investigated Timber should be selected from reused or recycled sources or be certified by an approved forestry management scheme such as FSC or AFS. The use of sustainable timber sources throughout the development will be investigated.
Concrete should have reduced Portland cement content by replacing with industrial waste product. The use of Portland replacement will be investigated
The use of steel of strength grade requirements as detailed in the appendix will be investigated The use of low VOC paints, carpets, adhesives and sealants will be investigated
Transport Initiatives
Walking paths should be safe and amenable. They should be well connected to walking paths at the site boundary. Where possible, the pathway link to the station should be improved
Safe bicycle parking facilities should be provided for residents as well as some facilities for visitors
Parking spaces on grade should be provided for car share programs. Council should be consulted for providing street parking for car share schemes
Urban Agriculture
Fruit tree plantings in the common landscaped areas to substitute for ornamental trees
Provision of garden plots to apartments to enable residents to plant small vegetable patches.