

Hassell

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Coal Lader Sustainability  
Eco Centre

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ESD and Services  
Strategy

Hassell

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**Coal Lader  
Sustainability Eco  
Centre**

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ESD and Services  
Strategy

May 2006

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## Executive summary

This document has been developed in order to identify key Ecological Sustainable Development (ESD) initiatives for the upgrade of the existing coal loader site in Waverton to a new sustainability eco-centre.

The main initiative of the site is to develop a sustainability eco centre, which demonstrates some sustainable technologies that can be applied to a domestic house, and to some extent a small scale commercial office.

As the site will include demonstrative components, there is a good opportunity for equipment suppliers to advertise their products and potentially have these items donated. Products and technologies selected are chosen for their applicability to domestic markets for homes and home office as a good demonstration. The general strategy describes minimum services and systems that shall be included as a base design, with the capacity to add to the design or include particular alternatives pending sponsorship or money grants from industry.

The existing services on site are old, run down and potentially non code compliant. The exact underground reticulation paths are not known. The design will be based on all existing services being made redundant and replaced.

In accordance with good practice it is intended that sensible and appropriate levels of technology and design be applied to reduce energy wastage and carbon dioxide emissions arising from the operation of the facility. It is also intended to select materials and equipment, which have low toxicity levels and sustainable production techniques where appropriate.

The buildings are generally naturally ventilated and incorporate innovative technologies such as a solar air heating system. Elements comprising the building envelope will be upgraded to incorporate passive solar design concepts where possible. The extent of these works is somewhat limited by the heritage of the site.

It is an initiative of the site to 'go green' and take all site power demands off grid, by generating enough electricity on site, through photovoltaic (PV) cells and small wind turbines, to offset the power demands of the site.

The water cycle management of the site will include rainwater collection for flushing and irrigation as well as a domestic style waste water treatment plant. All domestic hot water will be solar boosted.

## 1.1 Design Intent

The information in this report describes the general ESD and services strategy proposed for the coal loader site upgrade at Waverton. The main initiative of the site is to develop a sustainability eco centre, which demonstrates some sustainable technologies that can be applied to a domestic house.

As the site will include demonstrative components, there is a good opportunity for equipment suppliers to advertise their products and potentially have these items donated. A list of potential sponsors has been included as a starting point, refer to Appendix B.

The general strategy describes minimum services and systems that shall be included as a base design, with the capacity to add to the design or include particular alternatives pending sponsorship or money grants from industry. Refer to scheme summary table in Appendix B.

### 1.1.1 Building Code Requirements

All new systems will be designed to comply with all relevant codes and standards, including:

- BCA
- Gas authority
- Local Council regulations
- All relevant Australian standards

## 1.2 The Site

The site is heritage listed. There are a number of buildings on the site. These include an old powerhouse building which is currently used as an office, one main house, a smaller house and some storage sheds.

There is an existing wetlands and small amenities block.

The coal loader platform is located south of these buildings and there are 4 existing services tunnels running the full length, under the platform.

### 1.2.1 Existing Services

The visible services on site are old, run down and potentially non code compliant. The exact underground reticulation paths are not known. Estimated services runs are indicated in the Scheme Sketches in Appendix A. The design will be based on all existing services (gas, comms, power, water) being made redundant and replaced.

It is understood that site power to the coal loader platform is currently 3 phase. This will be extended to run along the front of the platform for events.

### 1.2.2 Site lighting

Solar or wind powered lighting will be provided to light the site at night. Solar lights charge up during the hours of sunlight, and release the stored energy at night time. This reduces power demand for night time lighting and reticulation of cables throughout the site. Night hours will be limited to avoid disturbance to nocturnal animals.

### 1.2.3 Site Water Use

Refer to report from Patterson Britton for storm water and drainage systems proposed for the site.

### 1.2.4 Materials

The materials hierarchy is reduce, reuse then recycle. In the Australia market labour costs are relatively high and therefore designs often target labour saving processes which are more material

intensive. For example, it is seen to be more efficient to 'oversize materials' and cut back rather than accurately measure for site. Therefore the construction industry generally focuses on recycling rather than the labour intensive reusing.

Due to the planned community involvement in the Coal Loader project certain 'reduce' and 'reuse' cycles can be targeted, as well as 'recycling'. For example

- The demolished areas will be broken down with hammers and reused for paving.
- Where possible, waste products can be reintroduced into pavement and garden design although it is labour intensive.
- Inexpensive second hand furniture can be 'reused' rather than only targeting furniture with a recycled quantity.
- Reused Carpet. Used carpets can be reprinted to create an 'as new' appearance

Similarly, it may be possible to demonstrate some recycled paper used as insulation, that has been treated with fire retardant.

For new materials selection, a key element will be selecting materials which have a good indoor environment quality such as paints and carpets which give off low emissions (low or non Volatile Organic Compound (VOC) materials).

It will be an initiative of the site to avoid PVC in items with life cycles of less than 10 years. PVC generates toxins in its end of life processing, only items with long life cycle or product stewardship are allowed to have PVC content. Alternatives such as HDPE (high density polyethylene) can be used.

### 1.2.5 Green Site Power (option)

It is an initiative of the site to 'go green' and take all site power demands off grid. How this will be easily facilitated is to generate electricity through photo voltaic (PV) cells and small wind turbines, which connect directly to the grid. All on site power is drawn directly from the grid so to operate in a payback what you take scenario.

Small clusters of PV cells will each be connected to an inverter to connect to the grid. These will be best located in a suitable area that is not overshadowed by trees. The area of solar panel required is approximately 200m<sup>2</sup>.



### PV and Wind Power to Cover Site Power:

Estimated Capital Cost	\$250 000
Estimated cost saving/yr (electricity running cost)	\$5 400/yr
Estimated Carbon emission saving/yr	37 950 kgCo <sub>2</sub> /yr

The option of including electrical outlets throughout the site for electric vehicles is being investigated.

### 1.3 Metering

Smart energy and water meters will be introduced to display the energy and water used on the site. This can be beneficial to inform the users to assess their energy use in real time based on real values. For example, by identifying when peak energy and water use occurs then comparing with off-peak energy times are, users can best match their usage patterns to take advantage of off-peak times.

Metering should be an interactive and informative display.



### 1.4 Sustainability Centre

The main house will be converted into a public visitor centre which showcases domestic style sustainable technologies.

All base building appliances will be energy efficient, and specified with the highest star energy rating available. This includes energy efficient light fittings and office equipment.

The building is heritage listed and not a great deal can be done to modify the building envelope. However, the building envelope will be sealed and insulated as much as possible, incorporating double glazing or high performance single glass for all new glass. These measures will improve the energy efficiency of the building envelope.

The building is naturally ventilated. A new vented skylight will be installed to provide additional daylight penetration and assist heat rejection. Acoustic ventilation wall grilles will be provided to promote cross flow ventilation between spaces.

Ceiling fans will be installed to generate air movement, and provide physiological cooling.

#### Passive Solar Design:

Estimated Capital Cost	Costs associated with building costs.
Benefit	10-20% improvement in indoor comfort, reducing need for air conditioning.
Estimated Carbon emission saving/yr compared to a domestic air conditioning system (cooling only)	500 kgCO <sub>2</sub> /yr

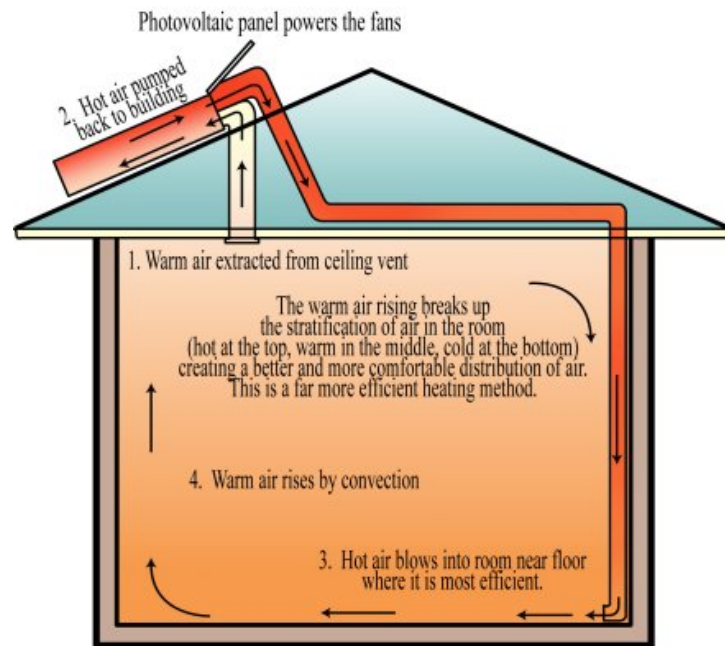
Sun Lizard solar air heating technology will be used to provide some heating in winter. The solar air heater uses the sun to heat a solar flat panel collector on the roof, in the same way that solar hot water heaters operate. Instead of water the collector heats air. Two collectors will be used. The air from the collector will be ducted through the roof to serve the front office section (refer to sketches in Appendix A) using a fan powered by a photo voltaic (PV) panel. This is most common for colder climates to provide some background heating. The system costs nothing to run after initial purchase so will provide free heating for the projected 20 years of its life.



#### Sun Lizard Heating:

Estimated Capital Cost	\$6500 (2 units)
Estimated cost savings	Saving of up to 60% off energy bill (compared to conventional electric heating) 2-5 years payback period
Estimated Carbon emission saving/yr	2000 kgCO <sub>2</sub> /yr

### Sun Lizard Winter Heat mode



Emergency lighting is to be by 'glow in the dark' emergency light technology. This absorbs natural daylight during the day and uses it to power emergency signage at night. This removes the requirement for batteries.



An existing domestic hot water tank is solar convertible, and will be converted to a solar boosted system. An evacuated tube solar water panel will be mounted on the roof to pre-heat water by the sun, and reduce the amount of heating required by gas or electricity.

#### Solar Hot Water Conversion:

Estimated Capital Cost	\$2000
Estimated cost saving/yr	Approx 70% saving of water heating costs/yr
Estimated Carbon emission saving/yr	750 kgCo <sub>2</sub> /yr

As part of the base scheme (if whole site green power generation is not achievable) a demonstrative domestic grid connected solar power system will be included. A grid connected solar system links a series of solar panels (mounted on the roof) through a power inverter to the grid.

Any excess power generated by the system is redirected to the grid, eliminating the need for battery storage. A Commonwealth Government initiative, known as the Photovoltaic Rebate Program, offers a monetary rebate for including PV cell power generation on site.

#### Domestic Grid Connected PV System:

Estimated Capital Cost	\$25 000 minus Government Rebate (\$4000): \$21 000
Estimated cost saving/yr	No real payback period, but no electricity running costs.
Estimated Carbon emission saving/yr	2400 kgCo <sub>2</sub> /yr

#### 1.5 Powerhouse (office)

The powerhouse building will be maintained as an office, but the facilities upgraded with a collinear approach to the ESD initiatives of the site highlighting potential small scale commercial applications.

The building is heritage listed and not a great deal can be done to modify the building envelope. However, the building envelope will be sealed and insulated to the highest level possible, incorporating double glazing or high performance single glass for all new glass. These measures will improve the energy efficiency of the building envelope/

New daylight baffles will be installed to promote deeper daylight penetration. Daylight improves general indoor environment quality, and reduces demand on generated power.

The building is to be primarily naturally ventilated. High level operable louvres and ventilators will be installed to assist in heat rejection from high level in summer, and closed off in winter. These louvres will operate automatically to night flush the building (pre cool thermal mass over night in summer). Existing windows will be made operable to allow fresh air to enter at occupant level.

#### Passive Solar Design:

Estimated Capital Cost	Costs associated with building costs. Insulation = \$2000 Glass louvres \$2000/m <sup>2</sup>
Estimated energy cost saving/yr	10-20% saving on cooling and heating demands
Estimated Carbon emission saving/yr	3300 kgCo <sub>2</sub> /yr

An existing packaged air conditioning unit on site will be reused and redistributed through the office to provide mixed mode operation for peak cooling conditions.

Early morning warm up will be provided by a gas fired hot water system which feeds local hydronic radiator panels reticulated through the office.

**Gas Fired Hydronic heating:**

Estimated Capital Cost	\$20 000
Estimated energy cost saving/yr	65% saving
Estimated Carbon emission saving/yr compared to conventional electric system	4800 kgCO <sub>2</sub> /yr

A cogeneration heating scheme is also being investigated as an alternative.

New power and communications reticulation will be installed. All light fittings will be specified as energy efficient and operate on daylight sensors to shut off lights when daylight can provide enough light.

Refer to Scheme sketches in Appendix A

A 'green lease' scheme will be included which describes minimum energy performance and sustainable benchmarks required as part of tenant fitout works, to promote sustainable use. For example tenants may have to achieve a 5 star AGBR (Australian Green Building Rating) fitout rating as part of the tenancy terms of agreement. This standard benchmarks the energy efficacy of the proposed fitout to best practice.

### 1.6 Amenities Block (Water cycle Management)

Refer to Patterson Britton report on site water capture.

The amenities block will be maintained, with upgraded water efficient fittings. Water saving ratings for fittings will be targeted at AAAA or higher, but at a minimum of AAA.

Toilets will be served from a gravity fed rainwater flush system.

Rainwater will be collected from all roofs on site and gravity fed to a large rainwater collection tank (Refer sketches). Rainwater is then pumped to a centralised header tank to gravity feed flushing and irrigation.

Potable water will be fed from mains as quality control for rainwater used as drinking water in a public domain is too onerous. However, the potential to have a chlorinator for demonstration purposes will be investigated.

The existing wetlands on the site will be retained and upgraded where necessary to accommodate overflow from the rainwater collection tank.

A domestic style waste water treatment system will be installed to treat black and grey water from the amenities block. This system will discharge to the existing pump out unit on site, to sewer. This pump out unit may require upgrading. Reuse water for toilet flush will be investigated but may present a public health risk.

Domestic hot water system for the amenities block will be solar boosted gas hot water, using high efficiency instantaneous gas hot water units. Use of captured rainwater in hot water heaters will be investigated however may present a public health risk.

### 1.7 Tunnels under Coal Loader Platform

Two of the tunnels will be opened to the public. Tunnel 1 will be an interpretive tunnel with items on display and artificially lit. Tunnel 2 will form part of a walking trail and will be naturally lit with artificial lits coming on when light levels are low.

The tunnels will be naturally ventilated, and power for lighting to be fed from the grid.

During the day tunnels will be lit naturally by skylights, the lights will be turn on automatically when light levels are low.

High efficiency light fittings will be specified for any lighting. Emergency lighting is to be by 'glow in the dark' emergency light technology where applicable.

Motion sensors will be included to control lighting and shut off when not in use to improve the energy efficiency of the lighting system.

### 1.8 Fire Protection

The extent of fire services to be investigated pending building classification.

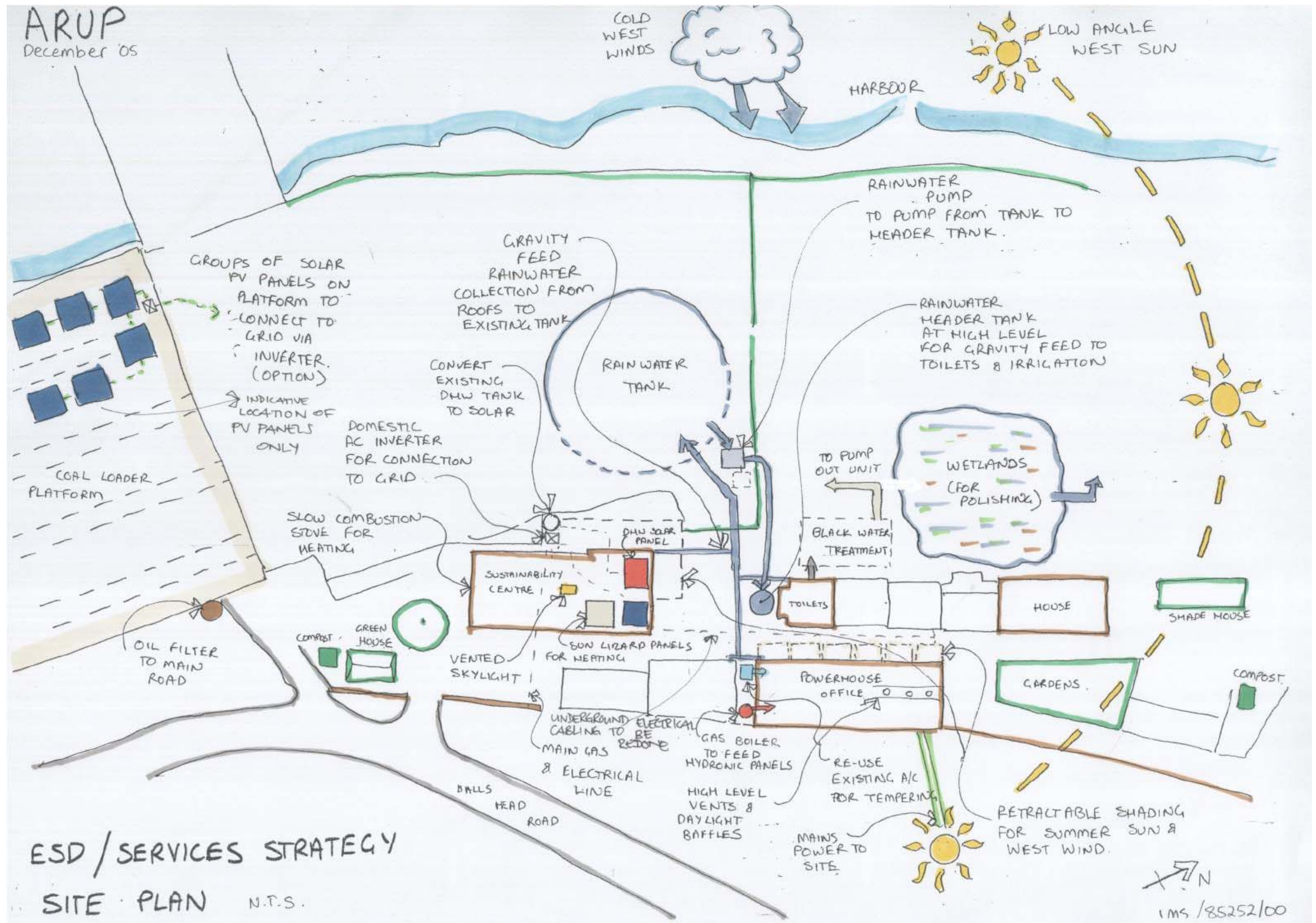
Fire services will be installed in accordance with the BCA and Australian Standards.

Appendix A

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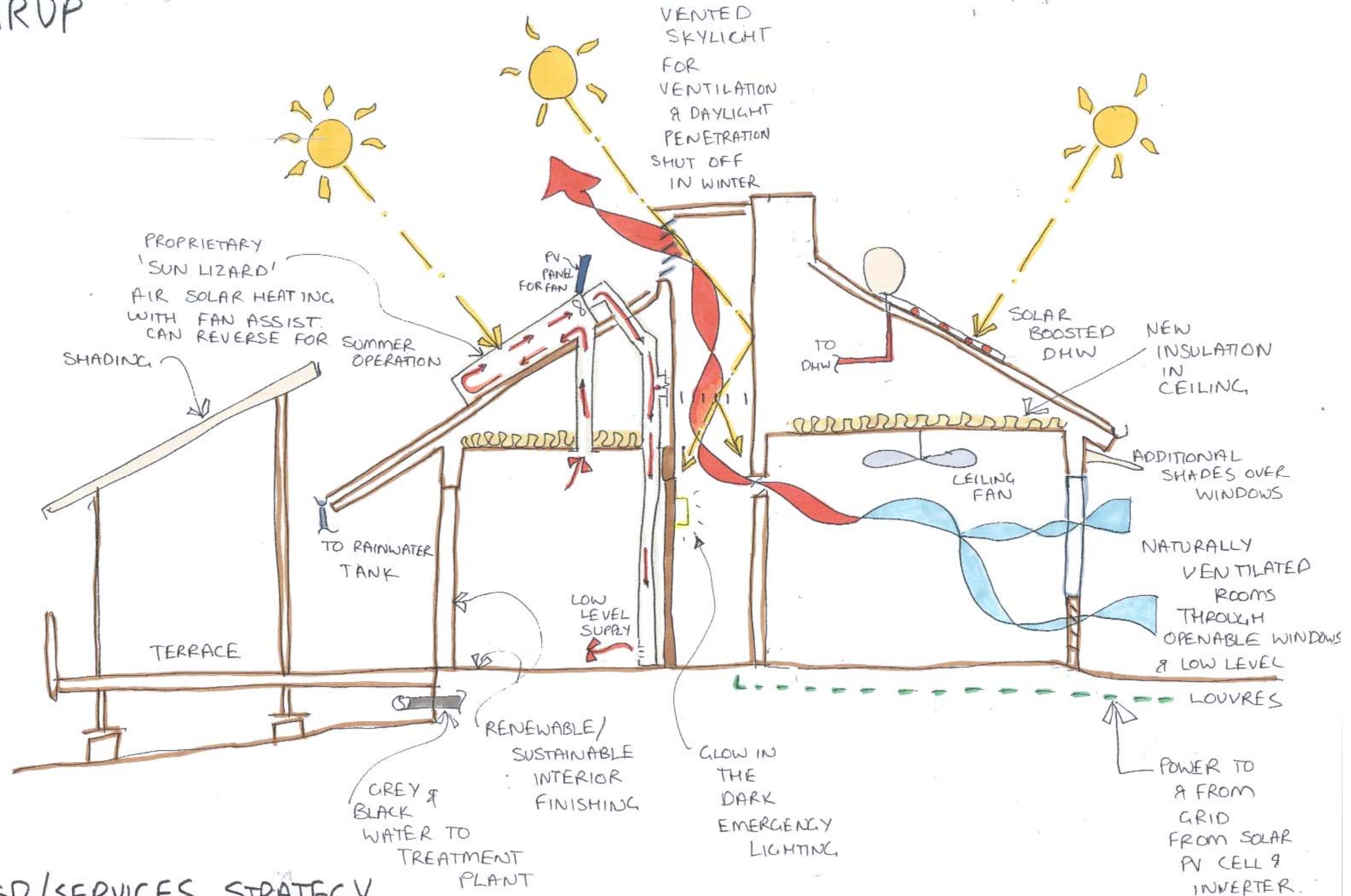
**Scheme Sketches**

A1 Site Plan



A2 Sustainability Centre - Section

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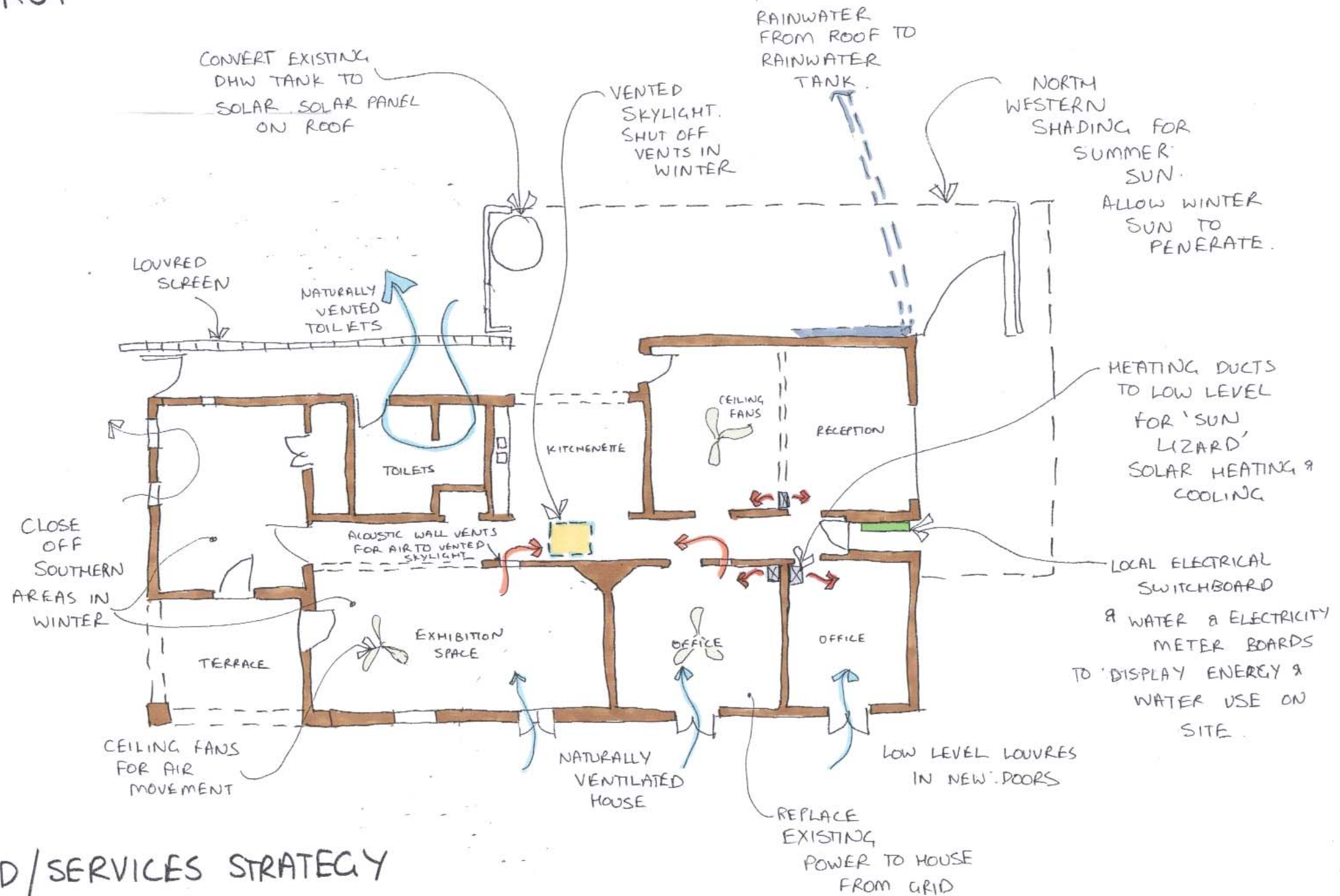


ESD/SERVICES STRATEGY  
SUSTAINABILITY CENTRE - SECTION

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### A3 Sustainability Centre - Plan View

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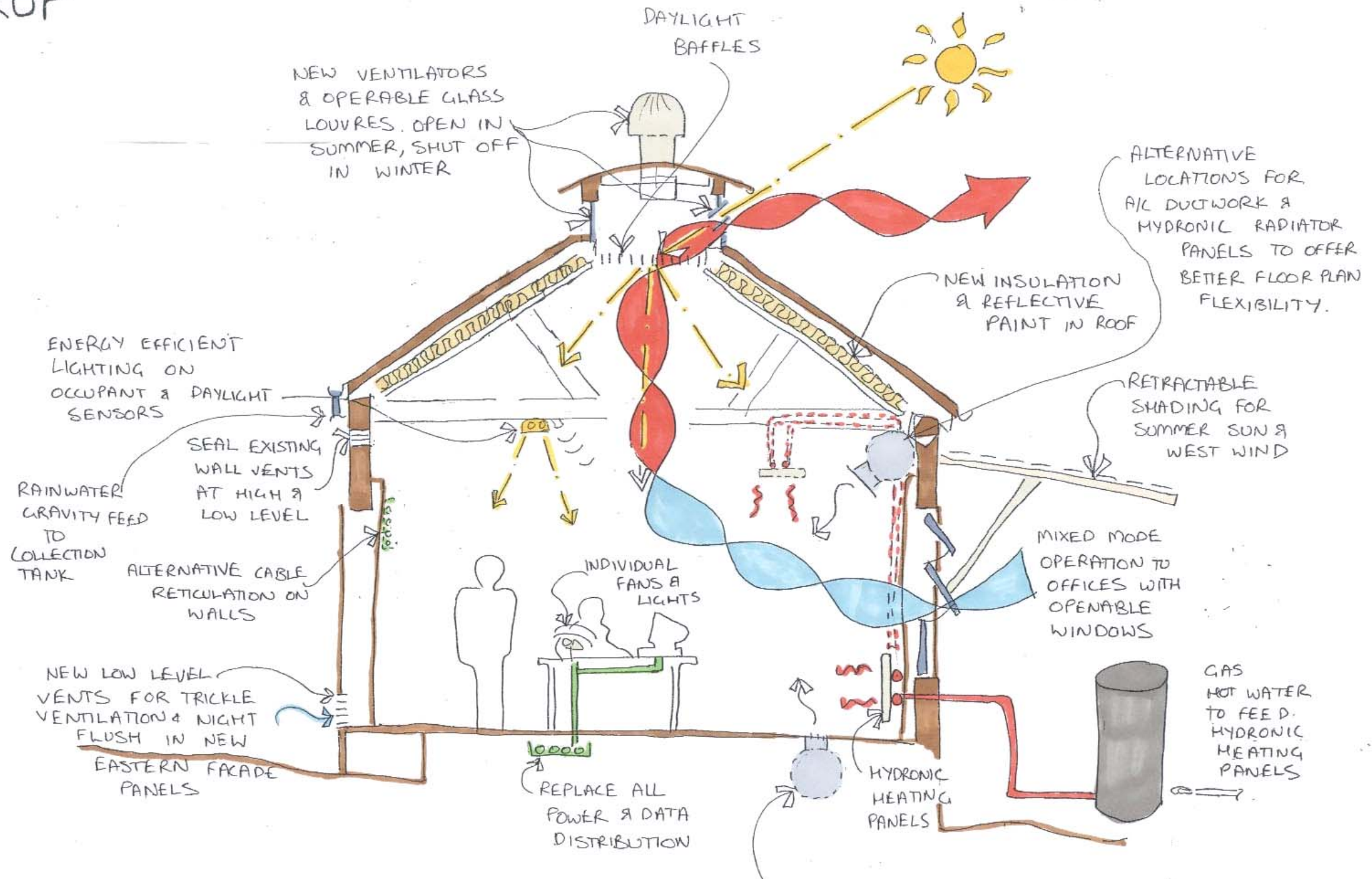
## ESD/SERVICES STRATEGY

### SUSTAINABILITY CENTRE - PLAN VIEW

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A4 Powerhouse (office)

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ESD/SERVICES STRATEGY  
POWERHOUSE OFFICE

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Appendix B

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**Scheme Summary table**

## B1 Scheme Summary Table

The information in the following table describes the general ESD strategy proposed for the coal loader site upgrade at Waverton, with some potential options. The main initiative of the site is to develop a sustainability eco centre, which demonstrates some sustainable technologies that can be applied to a domestic house.

Some of the cost and life cycle information in the table do not justify these technologies to be included purely on a monetary basis. However, we recommend that these technologies be included by principle especially in areas of water use and indoor environmental quality. It is the intention that some technologies only be included if the items can be sponsored.

We recommend that council or potentially the volunteer activist group start perusing some potential sponsors. Some contact information has been included in the table as a starting point. It is important to determine the likelihood of getting items donated at this stage as it will help to confirm which strategy to move forward with.

### B1.1 Summary Table

Also refer to notes below table

Building or site	Item	Description	Rough size	Estimated Cost	Life Cycle Assessment	Potential Sponsor (where applicable)
SITE/ GENERAL	Existing services – power, comms, water, gas	<ul style="list-style-type: none"> <li>existing services are old, run down and potentially non code compliant</li> <li>All existing services will be made redundant and replaced</li> <li>A detailed underground survey would need to be conducted if any services are to be modified and reused</li> </ul>	-	Refer to cost info in table and notes below	n/a	
	Site Lighting	<ul style="list-style-type: none"> <li>High efficiency, solar or wind powered lighting</li> </ul>		Cost neutral for distributed lighting		Site lighting: <a href="http://www.eets.co.uk/Lighting.htm">http://www.eets.co.uk/Lighting.htm</a> <a href="http://www.solagen.uk.com/lighting.htm">http://www.solagen.uk.com/lighting.htm</a> <a href="http://www.marlec.co.uk/products/products/greencol.htm">http://www.marlec.co.uk/products/products/greencol.htm</a> <a href="http://www.solargen.biz/products/lighting_solutions.htm">http://www.solargen.biz/products/lighting_solutions.htm</a> Solar-G: <a href="http://www.SolarG.com.au">www.SolarG.com.au</a> ph: 1800 20 4553
	Landscape and native planting	<ul style="list-style-type: none"> <li>Include on site</li> </ul>		Cost by others	n/a	
	<b>OPTION</b>					
	Site Power	<ul style="list-style-type: none"> <li>All power required for site to be generated on site by wind and PV cells. Power reticulation set up to draw directly from grid, but generate enough power to cover demands and payback what is taken or more.</li> </ul>	150 panels (160W each) Arranged in groups of 10 panels One inverter per group of ten panels  15 groups, 8m x 1.5m area per group  Total area required approx 200m <sup>2</sup>	\$250 000	No real payback benefit. (45 years payback)	Solar-G: <a href="http://www.SolarG.com.au">www.SolarG.com.au</a> ph: 1800 20 4553  BP Solar <a href="http://www.bp.com.au/solar">www.bp.com.au/solar</a> ph: 8762 5777  Origin energy <a href="http://www.originenergy.com.au">www.originenergy.com.au</a> ph: 13 24 61  Windside Wind Turbines
AMENITIES (WATER)	<b>BASE DESIGN</b>					
	ventilation	Naturally ventilated	-	-	n/a	-

Building or site	Item	Description	Rough size	Estimated Cost	Life Cycle Assessment	Potential Sponsor (where applicable)	
<b>AMENITIES (WATER)</b>	fittings	<ul style="list-style-type: none"> <li>Upgrade to AAAA/A fittings</li> <li>Gravity fed rainwater flush system</li> </ul>	-	Cost neutral for fitting etc Refer to Patterson Britton report	n/a	-	
	Waste water treatment	<ul style="list-style-type: none"> <li>Off the shelf domestic style aerated waste water treatment system</li> <li>Connect to sewer via existing pump out unit, potentially upgrade pump out unit.</li> </ul>	TBC	Waste water treatment plant: Ranging from \$10 000 to \$60 000 pending water quality level required	n/a	Taylex Clearwater through AAA Wastewater <a href="http://www.taylex.com.au">www.taylex.com.au</a> 1800 111 023 (vic) AAA wastewater contact: 9486 3158  Biolytix Technologies <a href="http://www.biolytix.com">www.biolytix.com</a> ph: 1300 881 472 or 07 5435 2700  Aquacell <a href="http://www.aquacell.com.au">www.aquacell.com.au</a>	
	Rainwater collection	<ul style="list-style-type: none"> <li>New guttering and reticulation to feed new rainwater tank</li> <li>New centralised header tank at high level on site</li> <li>New pump to pump rainwater up to header tank for flushing and irrigation</li> </ul>	-	Cost By others. Recommend using HDPE pipe in lieu of PVC pipe (30% more expensive)	n/a	Grundfos Pumps <a href="http://www.grundfos.com">www.grundfos.com</a> ph: 9648 0855	
	Potable water	Potable water from mains. New reticulation pipes	-	Refer Note 2		-	
	Domestic hot water	Solar boosted gas hot water	Estimate: * 4 panels required to serve site * One 300L tank to serve amenity block * one instantaneous hot water unit for amenity block  * Re-use existing tank to serve sustainability centre. Solar convert exiting tank	*\$850 per solar panel *\$1800/300L storage tank *\$1500/gas instantaneous hot water units Plus piping (approx \$1000) Refer Notes	10-15 years payback period	Rheem <a href="http://www.rheem.com.au">www.rheem.com.au</a> ph: 9684 9100  Solahart <a href="http://www.solahart.com.au">www.solahart.com.au</a> ph: 9684 9333  Edwards <a href="http://www.edwards.com.au">www.edwards.com.au</a> com'l: 1300 132 949 Res: 13 29 49 Head office: 9334 4222	
	<b>OPTIONS</b>						
	fittings	Use waterless urinal technology (TBC)	One pan	\$1100 per urinal plus piping and installation	n/a	'Uridan' by Watersave <a href="http://www.watersave.com.au">www.watersave.com.au</a> ph: 1300 368 603	
<b>OFFICE</b>	<b>BASE DESIGN</b>						
	Power and Comms	<ul style="list-style-type: none"> <li>Remove existing power and comms reticulation</li> <li>Provide new power and comms reticulation</li> </ul>	-	\$40 000 Refer Notes below	n/a	-	

Building or site	Item	Description	Rough size	Estimated Cost	Life Cycle Assessment	Potential Sponsor (where applicable)	
OFFICE	Ventilation and air conditioning	<ul style="list-style-type: none"> <li>Naturally ventilated, using thermal mass</li> <li>Seal existing leaky building as much as possible including door and window seals</li> <li>New ceiling/roof insulation and walls where possible</li> <li>Upgrade operable windows, and introduce low level operable vents. Open in summer, closed in winter</li> <li>Upgrade roof vents. Provide operable glass louvres at high level and roof ventilators. Open in summer, closed in winter</li> <li>Provide shade for summer sun and west wind</li> <li>Individual fans for localised air movement (tenant fitout item)</li> </ul>	<p>Operable louvres, approximately 15sqm</p> <p>Double glazing to new windows</p>	<p>Make good and seal building cost by others</p> <p>Glass louvres high level approx \$2000/sqm</p> <p>Double Glazing \$150/sqm</p>	5-10 years payback on insulation	<p>Glazing: AGP Pilkington Glaverbel GJames</p> <p>Roof vents: Edmonds <a href="http://www.edmonds.com.au">www.edmonds.com.au</a> ph: 1300 858 674</p>	
	Air conditioning - cooling (mixed mode operation)	Reuse existing air conditioning unit, with new reticulation, to provide tempering in 'hot spots' to limit temperature extremes.	-	\$20 000 Refer to Note 3	No benefit	-	
	Air conditioning – heating (mixed mode operation)	Gas hot water, to feed hydronic heating panels	-	\$20 000	10-20 years	-	
	Lighting	<ul style="list-style-type: none"> <li>New daylight baffles in roof vent for better daylight penetration</li> <li>Individual desk lights (tenant fitout item)</li> <li>T5 Indirect task lighting only</li> <li>Lighting controlled by occupant and daylight sensors</li> </ul>	-	Lighting Control: \$4000	1-3 Years	-	
	water	<ul style="list-style-type: none"> <li>Potable water from mains</li> <li>No hot water</li> <li>Kettle or Zippo boiler for kitchenette (tenant fitout item)</li> </ul>	-	Refer Note 2		-	
	<b>OPTIONS</b>						
			Direct indirect lights	-	\$16 000	n/a	-
		water	Share hot water supply with toilets or install separate solar boosted DHW system	-	Refer above	n/a	-
		Air conditioning – cooling (mixed mode operation)	Use proprietary evaporative cooling product	TBC	Est \$60,000-\$100,000 Difficult to obtain for size of installation	No benefit	<p>Air Solutions <a href="http://www.airsolutions.com.au">www.airsolutions.com.au</a> ph: 9979 7299</p> <p>AGO/DUES <a href="http://www.greenhouse.gov.au">www.greenhouse.gov.au</a> ph: 6274 1888</p>
		Air conditioning – cooling (mixed mode operation)	Use proprietary desiccant cooling product	-	\$50 000	No benefit	<p>Energy Conservation Systems DryKor <a href="http://www.ecsaustralia.com">www.ecsaustralia.com</a> ph: 1300 731 392</p> <p>AGO/DUES <a href="http://www.greenhouse.gov.au">www.greenhouse.gov.au</a> ph: 6274 1888</p>

Building or site	Item	Description	Rough size	Estimated Cost	Life Cycle Assessment	Potential Sponsor (where applicable)
	Air conditioning – heating (mixed mode operation)	<ul style="list-style-type: none"> <li>Solar hot water to feed hydronic heating panels (hot box)</li> </ul>	20m <sup>2</sup> Solar panels on roof plus a 4500L insulated storage tank (Option to include gas boosting to reduce number of panels and size of storage tank)	\$20 000 for panels up to \$20 000 for tank pending material selection		
	Air conditioning – heating (mixed mode operation)	<ul style="list-style-type: none"> <li>Proprietary Sun Lizard solar air heating</li> <li>Can be operated in cooling mode</li> </ul>	Approx 1.3kW/unit Estimated number of units = 5	Supply cost = \$2500/unit plus \$800 installation/unit (approx)	2-5 years payback period	Sun lizard <a href="http://www.sunlizard.com.au">www.sunlizard.com.au</a> ph: 9737 1566
<b>SUSTAINABILITY CENTRE</b>	<b>BASE DESIGN</b>					
	Ventilation and air conditioning	<ul style="list-style-type: none"> <li>Naturally ventilated through operable windows</li> <li>New ceiling/roof insulation and walls where possible</li> <li>Ceiling fans for air movement</li> <li>New vented skylight to improve heat rejection. Shut off in winter</li> <li>Acoustic wall grilles to promote cross flow ventilation and air to skylight</li> <li>Double glazing to new windows and doors</li> <li>Insulated ceiling</li> </ul>	One-two ceiling fans per room		Provides physiological cooling	Acoustic Air Grilles: Silenceair International Pty Limited Suite 1/48 Victoria Road, Rozelle, NSW. 2039. Australia Ph: 02 9555 7215 <a href="http://www.silenceair.com">www.silenceair.com</a>
	Power (For hot water refer to site)	New proprietary Solar PV panel with AC inverter for connection to and from the grid	1.5-2kW system	\$25 000 Refer Assumptions below -\$4000 potential government rebate for use of PV panels	No benefit Potential energy saving of approx \$340/year if item is sponsored	Solar-G: <a href="http://www.SolarG.com.au">www.SolarG.com.au</a> ph: 1800 20 4553 BP Solar <a href="http://www.bp.com.au/solar">www.bp.com.au/solar</a> ph: 8762 5777
	lighting	<ul style="list-style-type: none"> <li>New skylight to improve daylight penetration</li> <li>Glow in the dark emergency lighting</li> <li>Retain existing heritage lighting if code compliant</li> </ul>	-	Glow in the dark lights: \$15/light	n/a	Glow in the dark emergency lights: Wayout Evacuation systems <a href="http://www.lumink.com">http://www.lumink.com</a>
	Indicator panel – electrical and water	<ul style="list-style-type: none"> <li>Interactive Indicator panel to show extent of energy/electricity and water use on site</li> </ul>		\$40 000	This could potentially be a “smart” meter i.e. match use to available power and off peak rates.	Energy Australia <a href="http://www.energyaustralia.com.au">www.energyaustralia.com.au</a> ph: 13 15 35 head office: 570 George Street Sydney NSW 2000 Green touch Screen <a href="http://www.greentouchscreen.com">www.greentouchscreen.com</a> Watersave Australia <a href="http://www.watersave.com.au">www.watersave.com.au</a> ph: 1300 368 603
	Air conditioning – heating (mixed mode operation)	<ul style="list-style-type: none"> <li>Proprietary Sun Lizard solar air heating</li> <li>Can be operated in cooling mode</li> </ul>	Estimated number of units = 2	Supply cost = \$2500/unit plus \$800 installation/unit (approx)	2-5 years payback vs electric heating 8-12 years payback vs efficient gas system	Sun lizard <a href="http://www.sunlizard.com.au">www.sunlizard.com.au</a> ph: 9737 1566

Building or site	Item	Description	Rough size	Estimated Cost	Life Cycle Assessment	Potential Sponsor (where applicable)
<b>COAL LOADER PLATFORM</b>	Power	Potential performance space. Provide 3 phase power to platform.	May require additional substation or kiosk: TBC		n/a	
<b>TUNNEL</b>	<b>BASE DESIGN</b>					
	lighting	<ul style="list-style-type: none"> <li>▪ Skylights for daytime lighting with artificial lighting at when light levels reduce</li> <li>▪ One tunnel lit for circulation at night time. Power fed from grid.</li> <li>▪ Motion sensors included to control lighting</li> <li>▪ 20m of interpretive tunnel with display lighting</li> </ul>				
	Ventilation	Include ventilation within skylights to satisfy BCA requirements. Scope and details to be confirmed	-	TBC	n/a	-
<b>SHEDS</b>	Power	Run new power to sheds for lights an equipment	-	Pending details of intended use	n/a	-
	ventilation	Naturally ventilated, semi enclosed spaces	-	-	n/a	-

**Note 1: Assumptions**

Costing information is rough estimated ball park figures only, and is the Quantity Surveyors responsibility.  
More detailed design work needs to be undertaken to obtain more accurate numbers.  
Detailed design may have a significant impact on cost

Office electrical services assumptions:  
Comms rack and equipment by tenant  
Electrical supply to site and HSB does not need upgrading

**Note 2: Additional Cost information**

To upgrade all domestic cold water services to the amenity block, office and sustainability centre is approx \$30 000 including fittings and installation  
Sanitary drainage and plumbing services approx \$6000, excluding waste treatment plant cost  
To upgrade all gas services on site approx \$10 500

**Note 3: Exclusions**

Builders work costs  
GST  
Contractor overhead and profit  
Telephone and PABX systems  
AV systems