

Garigal

23 NARABANG WAY



Ecologically Sustainable Development

A CASE STUDY

eco



The outlook for small business has never been better.

Glenside ECO mission

Ten years ago Sydney developer David Hawes, and real estate agent Andrew Callaghan, identified a new market for Sydney's northern suburbs: strata offices — the home office away from home. David's first two strata office buildings in the Austlink Business Park in Belrose sold well and the selling prices of the strata units doubled within six years.

In 2006 Hawes built Garigal, a third strata office building in the Austlink Business Park containing 83 strata units. A 'first' for Sydney's general strata offices market, Garigal is based on the principles of ecological sustainability.

The strata units in Garigal are now selling.

Why make Garigal a sustainable strata office building?

"I decided to change the way I did business", said David Hawes. "I chose to put the environment into my projects because my buildings have an impact beyond the site.

"The way they used energy and water has a positive or negative impact on natural resources. And I see the prices of energy and water going up as we run out of these essential resources.

"We had completed our initial plans but we decided to change them as they took no account of the environment. I decided to reexamine the whole financial premise of the building and to focus on making Garigal sustainable — using the least amounts of water and energy possible.

So I asked my project team to review their work and make the project sustainable; to redesign it with the goals of not connecting to the Sydney Water sewer and eliminating the need for an electricity substation. Our target was to make the energy and water systems as sustainable as possible.

"I retained Michael Mobbs to coach the project team and with his advice we worked as hard as we could on the 80% of things we could do. We didn't beat ourselves up over the 20% of things we could not have an effect on, such as changing the layout of the block.

"We overcame the western sun by using blinds and installing overhanging balconies that are huge compared to the rest of the industry.

"We implemented a range of other features to drive down running costs and maximise occupants' enjoyment of their unique working environment, including recycling sewage and collecting rainwater for toilet flushing and garden irrigation, and natural cross-flow ventilation.

"Our changed development strategy appears to be ideal for the strata offices market as owners regard their offices in much the same way as their homes and they take real pride in them.

"It makes sense for owners of strata offices to want to reduce the amount of energy and water they use and to have real control over their costs of doing business.

"To many people low operating costs are as important as the purchase price."



Garigal Sydney's first sustainable strata office building.

Garigal—the first sustainable strata office building in Sydney

When Garigal was conceived in late 2003 only a few sustainable office buildings had been built in Australia. '60L' in Melbourne had been completed and '30 The Bond' in Sydney was nearing completion.

There were no strata office buildings in Sydney designed on sustainability principles so the Garigal design team had to start from scratch.

The sustainable-design office market has been dominated by single owner buildings housing large corporate tenants. Strata offices are much more difficult to make sustainable because the initial developer and the owners' corporation have limited control over design and usage decisions made by individual strata owners or their tenants.

Garigal was designed as a basic sustainable building which enables strata owners to add other sustainable features if they want to.

The earlier development of two conventional strata office buildings of similar size in Austlink Business Park by Glenside Group provided Garigal's designers with valuable benchmarks for testing the effects of sustainable-design concepts.

Each concept was compared with the existing buildings to determine the ecological improvement it could provide and the cost. This ensured the ESD budget for the Garigal project could be used cost-effectively.

Sustainability Coach Michael Mobbs worked with the Glenside Group throughout the project and was impressed with the perseverance shown by David Hawes and his team in overcoming tough design and operating problems.



Garigal: less greenhouse gas emissions, reduced power and water consumption, zero sewage discharge.

air



Stairwell and heat chimney: enables a natural flow of air through the building, reducing the need for air-conditioning.

Design philosophy

Sydney has a great climate and Garigal is surrounded by hectares of trees that pump out fresh oxygen every day. Giving owners the choice of natural ventilation on the many days when air conditioning is not needed enables them to save money by reducing electricity bills. This also provides a healthier and more productive work environment. When the weather is not suitable for open windows the occupants of the units can switch on their own individually-controlled, energy efficient inverter air conditioning system.

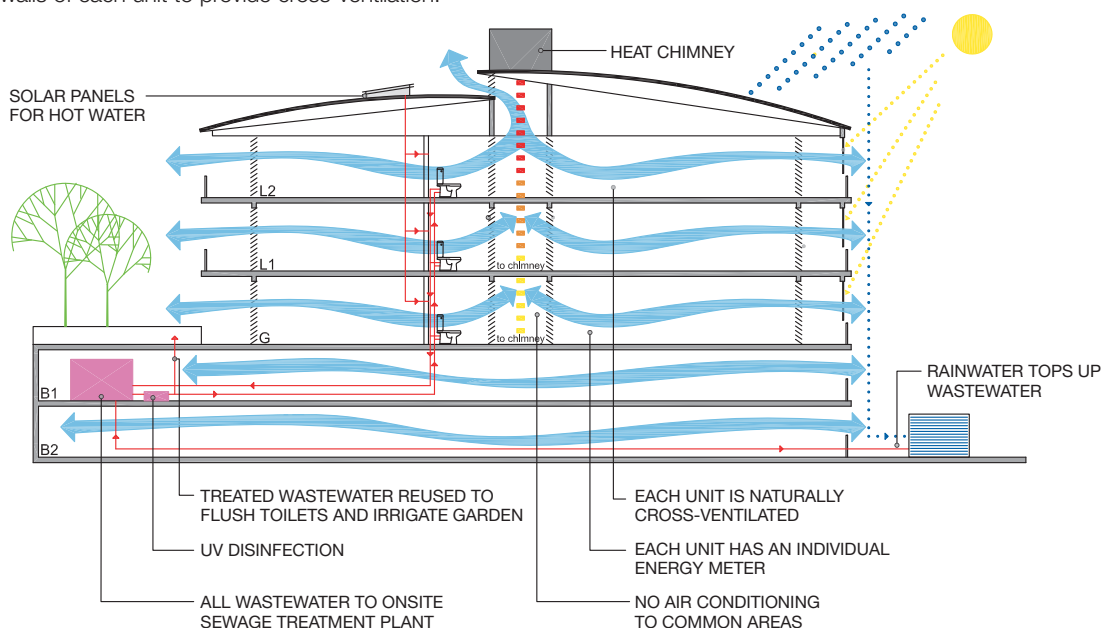
Natural ventilation—how it works

A major design challenge was to achieve cross-ventilation in a building with a central internal corridor, and where most units have only one external wall. The solution was to make the corridor a breezeway, putting adjustable louvre windows in the external and corridor walls of each unit to provide cross-ventilation.

Air flow along the breezeway corridors is generated by 'heat chimneys' at each end of the building. The heat chimneys were created by placing a black louvred 'box' at the top of each stairwell. The sun heats the box and air is drawn up the stairways from the Ground and Level 1 corridors, creating a natural air flow across individual offices when their external wall and corridor wall louvred windows are open.

The three storey atrium foyer in the centre of the building also acts as a heat chimney as well as providing a dramatic architectural feature incorporating a reflection pond.

The top floor differs in using a continuous clerestory window with thermostat-controlled electrically operated windows running along the ridge line of the roof, providing natural light and ventilating the top floor corridor. The corridor's electrical lighting can be over-ridden by a photocell actuated controller.





Solar activated blinds: the sun triggers sensors to lower the blinds—cutting heat-transfer and letting occupants open balcony doors to enjoy the resulting ambient air.

External solar-operated blinds

On each side of Garigal the balconies have been fitted with an automated, retractable-blind system controlled by solar sensors. They keep the air temperature down in summer and maximise the days windows can be opened.

The blinds can be down on the eastern façade to protect windows from the morning sun while up on other sides of the building.

By using a see-through fabric the blinds shade the glass and reduce glare but still allow enjoyment of the view. Wind vanes automatically retract the blinds and prevent them from being damaged by strong winds.

The blinds are located on the outer edge of the building façade instead of immediately in front of the windows. This creates a cool breezeway space between the blinds and the window glazing as well as shading the glass from the sun's radiant heat.

This maximises the hours when the windows can be opened to provide natural ventilation. And when air conditioning is required, the blinds reduce the heat load on the glass, energy consumption by the air conditioning plant, and electricity costs and greenhouse gas emissions.

Air conditioning

The power consumed by the air conditioning plant is the single largest contributor to greenhouse gas emissions from office buildings. Although Garigal reduces this by providing natural ventilation, there are times where air conditioning is needed for heating and cooling.

Recent advances in air conditioning technology such as chilled beam systems were examined but were not considered practical for a strata building with up to 83 separate occupants. So a system of split system individual inverter air conditioners for each office suite was adopted for Garigal.



External louvres: fresh air and less need for air-conditioning.

Inverter technology is superior to conventional air conditioning. Instead of simply turning on or off and running at full power, inverter air conditioning ramps up or down gradually as the room air is heated or cooled thereby saving energy.

Taking fresh air supply from an individual outside air duct connected to each air conditioning plant is another energy saving design feature. The air intake fan only operates when needed. This differs from many projects where make-up fresh air is provided by a central whole building fan system that runs constantly, even if only one unit is being occupied after-hours.

Each air conditioning unit is switched on or off and metered to the individual office suite it services, giving the occupier complete control over when the unit is used and power consumption. This also avoids having a central plant and whole floor system operating for a single user during after-hours use.

Carpark ventilation

Motor vehicles are still the primary form of transport to and from the office. Most occupants are expected to live within a 10km radius from Garigal, thereby reducing the travelling distance from home to office.

To minimise the impact of the on-site basement car parking it is naturally ventilated—eliminating the need for an exhaust fan system and reducing energy costs.

water



Landscaping: a ready supply of greywater is available to nurture the gardens.

Design philosophy

Over 70% of the water consumed in office buildings is used for flushing toilets. Garigal has its own water recycling plant that treats sewage to produce grey water to flush the toilets and water the gardens.

By not connecting to the Sydney Water sewerage system Garigal saves thousands of litres of high quality potable water each year. Strata owners will have lower water bills and avoid paying sewerage rates.

Sydney Water mains potable water is supplied to all kitchenette and bathroom taps for drinking and other uses.

Watering restrictions are likely to be with us for the foreseeable future but Garigal will be unaffected as it provides its automated garden-irrigation system with water from the sewer recycling system and rainwater harvesting tanks.

This results in our gardens looking healthy without consuming precious drinking water from Sydney Water's mains.

Sewer recycling—how it works

All wastewater from the building is piped to a 54,000 litre compartmentalised concrete tank in the water treatment plant on the basement level.

Water enters the primary chamber where primary sedimentation and anaerobic digestion take place. It then passes through a series of secondary treatment chambers where it undergoes aerobic digestion, denitrification and clarification.

The treated liquid is filtered in a 10,000 litre multi-media filter unit, and irradiated with UV light before being pumped out for use in flushing toilets.

Excess treated water is used for watering the gardens and a trade waste connection removes excess water should the system storage reach capacity, particularly during prolonged wet weather.

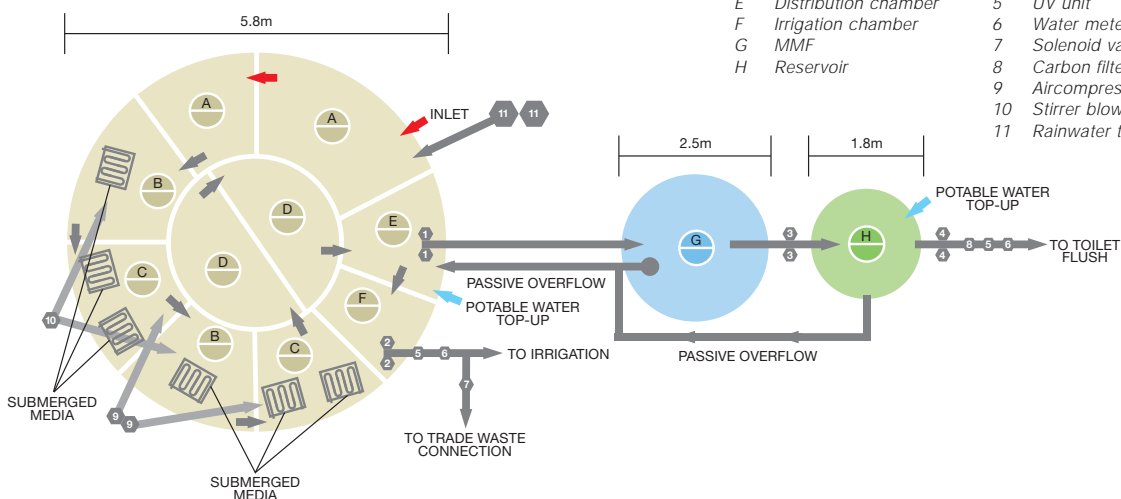
Sewerage system

Treatment process

- A Primary chambers
- B Anoxic chambers
- C Aeration chambers
- D Clarification chamber
- E Distribution chamber
- F Irrigation chamber
- G MMF
- H Reservoir

Mechanical devices

- 1 Submersible pumps
- 2 Submersible pumps
- 3 Surface mounted pumps
- 4 Variable speed pumps
- 5 UV unit
- 6 Water meter
- 7 Solenoid valve
- 8 Carbon filter
- 9 Aircompressors
- 10 Stirrer blower
- 11 Rainwater tanks





Water tanks: up to 40,000 litres

Regular testing and maintenance ensures the system is operating effectively within the Warringah Council and Sydney Water guidelines.

It is estimated that when Garigal is fully tenanted the wastewater treatment plant will treat 4,900 litres of wastewater per day, 5 days per week for 52 weeks per year.

That's 1,274,000 litres p.a. of sewage p.a. not sent to pollute the Pacific Ocean via Sydney Water's sewerage system.

Rainwater harvesting

Because the quantity of excess treated wastewater may not be adequate for garden watering two 20,000 litre rainwater collection tanks have been installed. Garigal should never need to use potable water from the mains for toilet flushing and gardening once the building is fully occupied. And the adjacent bushland will receive a little more water from Garigal than it would have received in its natural undeveloped state.

energy



Lifting values: gearless traction mechanics use less power and are smoother in operation.

Design philosophy

Reducing energy consumption and lowering operating costs benefits our environment by reducing greenhouse gases, makes good business sense and helps occupants of Garigal to be responsible corporate citizens.

Key features

Internal lighting Using low voltage lighting was a deliberate decision and the project has fluorescent fittings through-out. The triphosphor tubes used for office and corridor lighting have electronic ballast which is 30% more efficient than standard fluorescent fittings and a longer life which results in lower tube replacement and maintenance costs.

Lighting controls Instead of leaving car park, bathroom and corridor lighting on day and night, common-areas have been fitted with controls to minimise running time and energy usage. This equipment includes time clocks, movement sensors and photo-electric light sensors.

Air conditioning and natural ventilation The energy savings derived from natural ventilation systems are detailed in the AIR section. Having no common-area air conditioning system also saves energy. Each unit has its own inverter air conditioning system with individual controls and metering.

Lifts Garigal's gearless traction lifts use less power than the hydraulic lifts used in other projects. They're also quieter and provide a smoother ride. To reduce power consumption even further their lighting is kept in standby mode, activating only when the doors open.

Hot water Two solar-powered hot water storage units located on the roof of the building provide hot water to the common area bathrooms.

Occupant fit-out In a strata office building the original developer has limited control on how individual owners will fit out their office unit. Glenside Group has minimised energy consumption by installing efficient lighting, air conditioning and natural ventilation. It is beholden on unit-owners to continue this low energy consumption in their own fit-outs.



Only as needed: timers, movement and photo-electric light sensors ensure efficient use of lights in the common areas.



Clerestory window: natural light and fresh air.

environmental benefits



Neighbours: Garigal is set on the very border of it's national park namesake.

When fully occupied, Garigal's ESD features will result in:

- reduction of base building power consumption of 50% to 60% compared to projects of similar design
- reduction of greenhouse gas emissions of up to 770 tonnes per annum for the building (on average 9.3 tonnes pa for each unit). This is equivalent to taking 2.5 cars off the road for each one of the 83 suites in the development (1).
- reduction of mains water consumption of 1,274,000 litres per annum. This is equivalent to filling 20 domestic swimming pools each year (2).
- zero sewage discharge to ocean outfalls. Garigal is not connected to the sewer! All waste water is treated and recycled.

1. An average car that travels 15,000 km/yr and consumes 10litres of petrol per 100km generates 3.6 tonnes of greenhouse gas emissions per year. The 770 tonnes reduction in emissions is equivalent to 214 cars (770/3.6), or ~2.6 cars per unit (214/83 units).

2. The average domestic pool is 9m long, 4.5m wide and has an average depth of 1.5m. Total volume = 61,000 litres.

occupant benefits



Inside and out: floor-to-ceiling windows and sizeable balconies provide ample natural light.

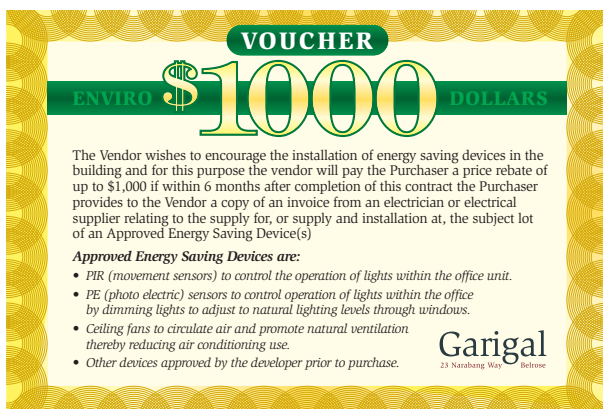
Economic benefits

No annual sewer rates The waste water treatment plant allows complete disconnection from the sewer.

Reduced electric power bills Due to energy-saving design initiatives including natural ventilation, solar activated external blinds, and energy efficient lighting and air conditioning.

Average savings in running costs of up to \$1,175 per unit per year (approx. \$17 per sqm of strata area). This is an estimated 30% reduction in strata outgoings compared to equivalent previous projects.

\$1000 voucher To encourage unit purchasers to consider how they can reduce energy consumption and greenhouse gas emissions, Glenside Group has made a unique offer. The owner of each unit will receive a voucher for \$1,000 per unit to be spent at their discretion on energy saving initiatives such as lighting sensors, a 4 star or higher rated refrigerator, ceiling fans or other approved energy saving devices.



Healthier work environment

Ability to open windows to access fresh air and obtain natural cross-flow ventilation.

Individual air conditioning systems in each suite and no central plant eliminate the risk of 'sick building syndrome'.

Private balconies from each suite take full advantage of the natural bushland environment — open outlook and fresh air.

A direct consequence of designing Garigal for ecological sustainability is a more natural work environment in which workers have greater control of temperature and ventilation. Greater comfort leads to happier workers.

A number of studies have shown that when workers have control of their own work environment there is less absenteeism due to sickness and other reasons, and workers are more productive. They are more interested in what they are doing, they do more work and they make fewer mistakes.

Corporate image

Business owners will receive recognition for operating from an environmentally responsible building. In the future there may be more tangible benefits, for example, from selling credits in a carbon credits system.