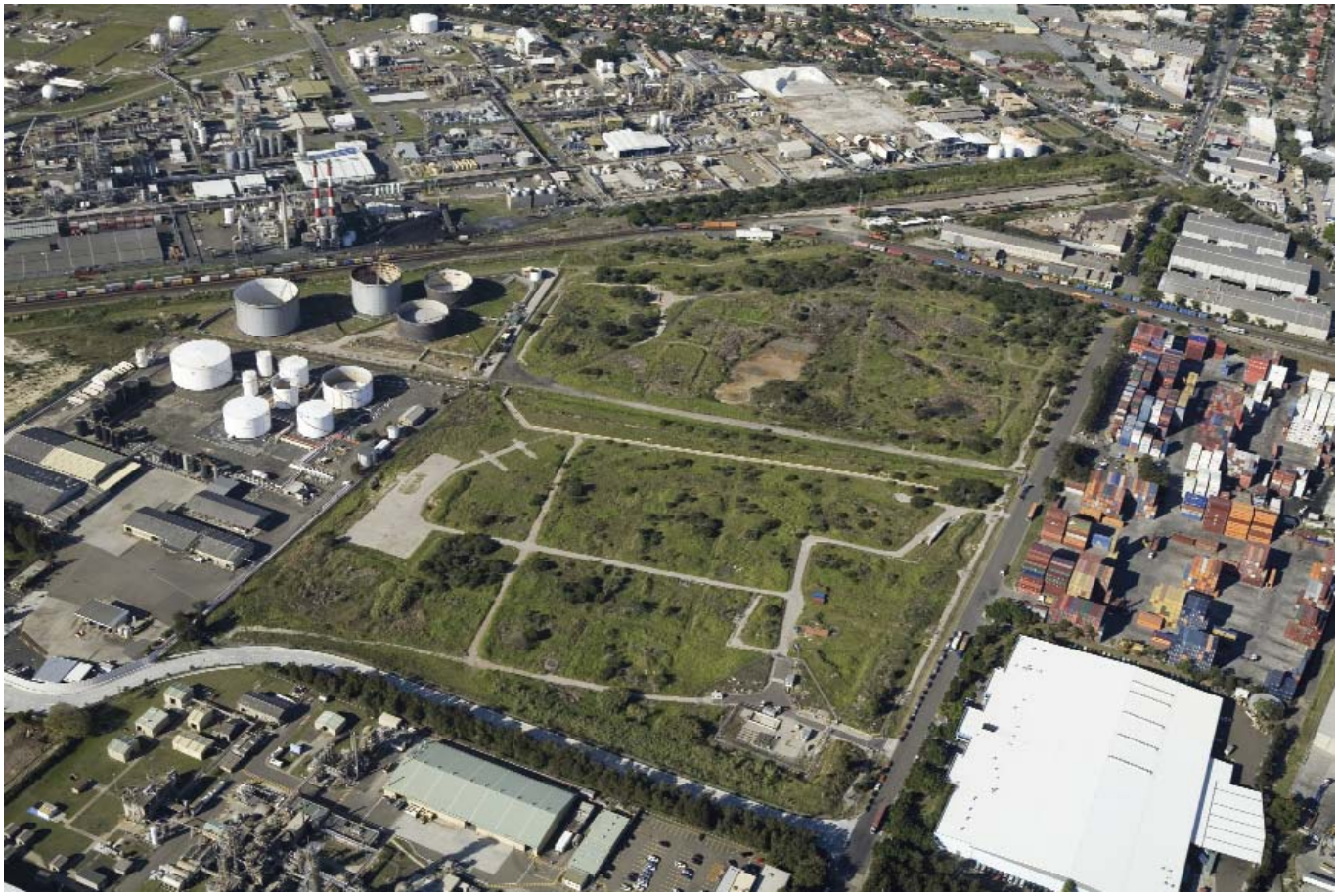
Southlands Remediation and Development Project

Environmental Assessment
Project Application (MP 06_0191)

Appendix R: Water and Energy Efficiency Report



August 2009

Connell Wagner Pty Ltd
ABN 54 005 139 873
116 Military Road
Neutral Bay
New South Wales 2089 Australia

Telephone: +61 2 9465 5599
Facsimile: +61 2 9465 5598
Email: cwsyd@conwag.com
www.conwag.com

Orica/Goodman International

Southlands Development
Water and Energy Efficiency Report

9 January 2008
Reference 22202.01
Revision 5

Connell Wagner

Document Control

Document ID: Y:\22202\ENG\PES\ENERGY REPORT\SOUTHLANDS_WATERENERGY_REPORT_REV4.DOC

Rev No	Date	Revision Details	Typist	Author	Verifier	Approver
0	27/10/06	Draft	SG	SG	DB	DB
1	27/11/06	Draft	SG	SG	DB	DB
2	11/12/06	Draft	SG	SG	DB	DB
3	20/04/07	Final – for issue	SG	SG	DB	DB
4	2/10/07	Final – for approval	SG	SG	DB	DB
5	2/10/07	Final	SG	SG	DB	DB

Contents

Executive Summary

This report outlines key water and energy efficiency measures proposed for the Southlands development.

The Project involves the transformation of an underutilised parcel of industrial land into a major new warehouse / industrial estate. New development on the site will involve the construction of a number of new buildings on staged basis. This report addresses the water and energy efficiency measures that will be incorporated into the development of the Estate and the individual buildings.

The objective is to ensure that future warehouse developments on the site are comfortable to work in, use minimal energy, are economical to run, provide opportunities for water savings and reuse and contribute positively to an overall reduction in greenhouse gas emissions based on the City of Botany Bay Energy Efficient Development Control Plan.

The key considerations in relation to water and energy efficiency principles for the development include:

- Solar access and evaluation of overshadowing of adjoining properties.
- Energy efficiency influences on the design in terms of building form and construction.
- Incorporation of natural ventilation as a passive cooling strategy.
- Justification of heating, air conditioning and hot water system requirements and selection.
- Energy efficient lighting systems.
- Water efficiency and rainwater harvesting.

One of the most significant water conservation options is the potential use of the treated water from the Orica Groundwater Treatment Plant (GTP) located on the adjacent Botany Industrial Park (BIP). The GTP is currently treating groundwater to a quality that can be beneficially used for a wide variety of purposes. Treated water from the GTP is currently being used for industrial purposes on the BIP and by adjacent industry. It is envisaged that additional treated water will be available for use for non-potable uses including industrial applications (especially where there is high water use potential), toilet flushing, landscape irrigation, fire fighting (backup tank top up). There is also potential for this water to be used in other sites where non-potable water sources are required in significant volumes.

Minimum Performance criterion in accordance with the City of Botany Bay Development Control Plan is summarised in the table below. The measures proposed to be adopted for the site have been tested against the matters outlined in the Botany Energy Efficiency DCP. This demonstrates that the proposal will achieve enhanced environmental outcomes including appropriate energy and water efficiency achievements over the life of the development.

Table 1.1: Performance against City of Botany Bay Energy Efficient Development Control Plan

Performance Measure	Minimum Performance Criteria
Solar Access	Buildings will be designed to maximise the benefits of solar energy through appropriate orientation. The development is to maintain a minimum solar access of 2 hours on June 21 to solar collectors of adjoining properties.
Building Form & Construction	Building materials will be from renewable/sustainable sources. ▪ Insulation: Roof or ceiling – R2.5 ▪ Insulation: Walls – R1.5 ▪ Glazing: Shading co-efficient 0.4 ▪ Glazing: U-Factor 6 W/m2 degrees centigrade ▪ Glazed areas shall not comprise more than 50% of the total wall area, unless a high efficiency glass is used.
Heating, Ventilation & Air Conditioning	Air Conditioning Efficiency Factor: ▪ Commercial 0.75 ▪ Warehouse/industrial buildings shall be equipped with permanent ridge venting. ▪ Natural ventilation is used in buildings and any decked car parks where possible. ▪ Mechanical ventilation systems in car parks shall install CO monitors and variable speed drives if enclosed.
Lighting	The extent of lighting will be relevant to the use of the area. Average Lighting Power Density: ▪ Commercial 12 W/m2 ▪ Warehouse 3.5 W/m2 per 100 lux ▪ Space lighting (eg. to enhance landscaped area) shall be solar powered. ▪ Lighting for third party advertising signs shall be solar powered. ▪ Lighting control device (such as time sensors or movement sensors) shall be installed to ensure that lights are not left on when not required. ▪ Warehouses shall install skylights in at least 10% of the roof area and lights should be linked to photo-electric dimming.
Water	Use of recycled water on site for non-potable uses proposed from stormwater harvesting and the Orica GTP at the BIP (it the latter is available and appropriate). Hot water systems of domestic scale shall be rated a minimum of 3.5 stars. AAA rated water efficient showerheads and water tap fittings for basins and kitchen sinks shall be installed. Rainwater harvesting to be used for non-potable uses
Appliances	Energy efficient appliances shall be installed in all buildings as perr DCP requirements.

Note: The DCP does not require an applicant to address or comply with the minimum performance criteria for building form and construction or heating, ventilation & air conditioning where a building is not designed to be heated, cooled or ventilated using non-renewable energy.

1. Introduction

1.1 Scope

This Report outlines key water and energy efficiency measures proposed for the Southlands development.

The Project involves the transformation of an underutilised parcel of industrial land into a major new warehouse / industrial estate. New development on the site will involve the construction of a number of new buildings on staged basis. This report addresses the water an energy efficiency measures that will be incorporated into the development of the Estate and the individual buildings.

The objective is to ensure that future warehouse developments on the site are comfortable to work in, use minimal energy, are economical to run, provide opportunities for water savings and reuse and contribute positively to an overall reduction in greenhouse gas emissions based on the City of Botany Bay Energy Efficient Development Control Plan (DCP).

The issues that are addressed in this report include:

- Solar Access
- Building Form and Construction
- Heating, Air Conditioning and Ventilation
- Lighting
- Water usage
- Appliances

The intention of compliance with the requirements outlined in the DCP is to demonstrate that the proposal will achieve enhanced environmental outcomes including energy and water efficiency over the life of the development. The reduction in the use of non-renewable energy sources and minimisation of energy costs will address these matters while maintaining acceptable levels of comfort within future buildings to be located on the site.

The main aim of this report is to identify the appropriate water and energy conservation measures that will be applied to the development through the various Project Commitments to be agreed. The water and energy efficiency report provides appropriate justification for the proposed energy efficiency measures and includes setting of goals for the annual energy consumption of future buildings (including occupants energy use) in Mega joules (MJ), energy per unit of floor area per annum (MJ per m^2 per year), carbon dioxide (CO^2) emissions per annum (CO^2 per m^2 per year) and megalitres per person (ML per year).

1.2 Objectives

The objective of this report is to identify the structural measures required to control energy use, water quantity and quality at a sufficient level of detail to integrate with the investigations undertaken at the strategic level for the Environmental Assessment of the Southlands site. The water cycle management objectives for the site are:

- **Environmental**: Provision of appropriately designed, functional facilities; limitation of downstream discharge peaks and velocities; soft bioengineering treatments to optimize landscape function; water sensitive urban design.
- **Urban Amenity**: Implementation of an energy efficiency and stormwater management strategy that is integrated with overall site design; provision of design that enhance amenity, and views into and out of the riparian zone.

- **Engineering**: Effective management and control of energy use, peak water discharges, velocities and flood levels in line with Council's policies; implementation of best practice for water sensitive urban design and energy efficiency measures.
- **Economics**: Provision of a cost effective, functional response to energy and water efficiency that optimises performance, minimises maintenance costs, provides maximum value and emphasises ecological sustainability.

1.3 Building Design Intent

The design intent of the building development in relation to water and energy efficiency is to achieve:

- Improved employee comfort and health, thereby, productivity and loyalty;
- Reduced energy costs;
- Reduce greenhouse gas emissions;
- Improve water cycle management;
- Reduced maintenance costs;
- Improved capital value retention; and
- Improved leasability / saleability of buildings.

Section 2.0 of the DCP sets out the submission and compliance requirements for any commercial or development over $250,000.

The matters to be addressed in the DCP are outlined in Section 2.0.

2. Assessment of Water and Energy Efficiency

2.1 Description of the Proposed Development

The Southlands proposal is for a staged industrial development that will ultimately comprise warehouses. There will be an office component to the warehouses which is anticipated to nominally be in the order of a maximum 10-15% of the floorspace of the warehouse. Ground level car parking will be provided to the development. New roads and services will be required to service the development site.

2.2 Industry Best Practice Water Conservation Principles

The City of Botany Bay Council polices requires the use of industry best practice water sensitive urban design ('WSUD') techniques to mitigate the impacts of urban development. Such techniques, used in conjunction with each other, can achieve the reduction of flow rates generated from existing and introduced impervious surfaces to emulate natural conditions and to remove pollutants generated from the altered land use.

This report has considered appropriate WSUD measures as follows:

- The rehabilitation of Springvale Drain to emulate natural channel features used to transport water flows
- The limitation of impervious surfaces as far as practicable and use of native vegetation is promoted.
- Stormwater reuse is proposed to reduce potable water consumption.
- The use of on-site oil and grease traps, and sediment traps for large vehicle parking areas to improve runoff water quality.
- The use of spill containment devices in the stormwater system to mitigate the impact and assist in the clean-up of accidental chemical and oil spills.
- Use of erosion and sediment control measures, especially during construction.

Where appropriate these measures have been incorporated into the project and are shown on the landscape plans for the development of the Southlands site. Examples of treatments in other development are shown in the following figures to show the overall intent.

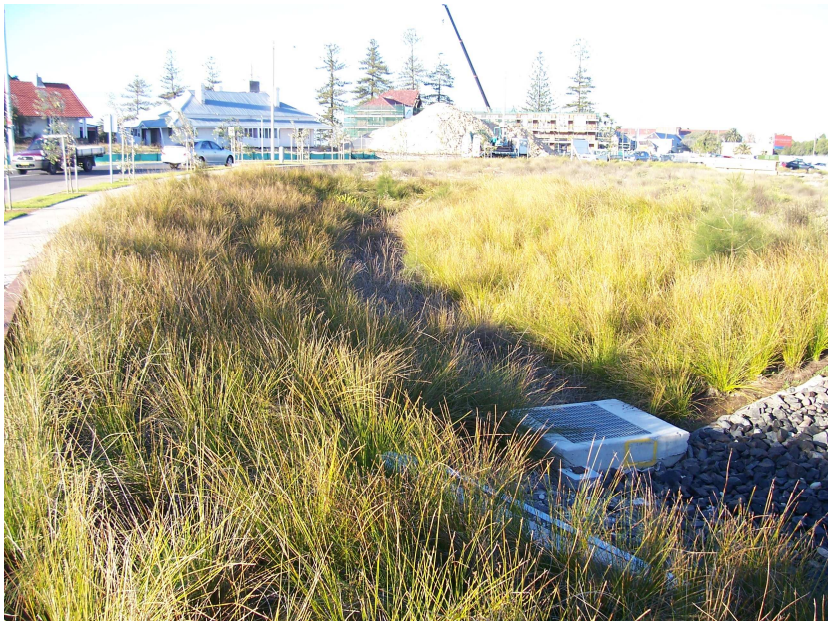


Figure 1: Example of how a vegetated swale/creek can be used for water quality control

Figure 2: An example of how landscape can be used to conserve and utilise stormwater

One of the most significant water conservation options is the potential use of the treated water from the Orica GTP on the adjacent BIP which has a design capacity of 15 mega litres a day. The GTP is currently treating groundwater to a quality that can be beneficially used for a wide variety of purposes. Although this cannot be used for a potable supply (which is a very low demand on the proposed Southlands development in any case) there is potential for it to be used at the proposed Southlands development for non-potable uses including industrial applications (especially where there is high water use potential), toilet flushing, landscape irrigation, fire fighting (backup tank top up).

2.3 Compliance with Botany Energy Efficient DCP

The measures adopted for the site have been tested against the matters outlined in the Botany Energy Efficiency DCP as outlined in Table 2.1 below.

Table 2.1 Compliance with Botany Energy Efficiency Development Control Plan

DCP Provision	Design Response	Compliance
3.1 Solar access and overshadowing		
Commercial and industrial buildings should be designed to maximise the benefits of solar energy through appropriate orientation. The siting and orientation of the building shall also ensure that the proposed building does not materially increase overshadowing to adjoining properties and reduce the level of solar access to these buildings.	Proposed buildings and structures will be such that siting and orientation will utilise natural lighting (where possible) throughout the day using translucent panels, windows and roof sheeting in warehouse areas. The setbacks to adjoining properties will ensure that there will be no adverse overshadowing impacts.	✔
3.2 Building Form & Construction		
Renewable/Sustainable Building Materials All building materials chosen shall consider the following environmental impacts: • damage suffered by the environment during extraction of raw materials; • renewability of raw materials; • recycled content; • solid, liquid and air pollution due to manufacture and production; • embodied energy; • environmental impact during life cycle; • waste and packaging; and • recycability of the demolished materials.	Materials to be utilised in the building construction will include concrete, steel, wood, aluminium and masonry from renewable/sustainable sources. Such materials are commonly used in industrial building construction, are not scarce or in short supply and have similar or lower environmental impacts to other forms of building materials. • Building materials shall be. ▪ Insulation: Roof or ceiling – R2.5 ▪ Insulation: Walls – R1.5 ▪ Glazing: Shading co-efficient ¼ 0.4 ▪ Glazing: U-Factor ³ 6 W/m2 degrees centigrade Glazed areas will typically not comprise more than 50% of the total wall area. Where greater, high efficiency glass will be used. The use of recycled materials will be dictated by the building requirements of the warehouses. Typically, the use of recycled products will be used in civil works for the establishment of the ground surfaces, roads and landscaping areas. The fill material to be used will be clean (VENM) material utilised from excavation of other building sites or road projects. Materials used will be recyclable.	✔
Thermal Mass Use building materials that have a higher thermal mass such as bricks, concrete and stone.	Materials such as bricks, concrete and stone will be used in the building construction to increase thermal mass. Typically walls of warehouses will be precast tilt concrete panels.	✔

DCP Provision	Design Response	Compliance
Insulation • Bulk insulation traps air providing a physical barrier to the flow of heat and includes materials such as fibreglass, cellulose fibre, natural wool and expanded polystyrene. • Bulk insulation must be installed in compliance with Australian Standard AS 3999. • Reflective insulation reduces the flow of heat from a hot to a cold body and includes such materials as reflective foil laminate or sarking. • Reflective foil insulation must be installed in compliance with Australian Standard AS 1904 Code of practice for installation of reflective foil laminate in buildings.	Bulk insulation traps will be used in walls and in the roof cavity (if any) in compliance with AS 3999. Roof area will have reflective insulation and in accordance with AS 1904.	✔
Shading Devices • Shading devices such as flexible canvas devices should be used to shade shopfronts which receive direct summer sunlight. • Vertical shading devices such as blinds, shutters, adjustable awnings and landscaping should be used for east and west facing windows. • North facing windows should be shaded from direct summer sun by external, horizontal devices such as awnings, upper floor balconies, eaves and overhangs.	Where staff areas are to be provided, the use of shading devices such as flexible canvas, blinds, adjustable awnings and shutters will be used for eastern and western facing buildings. Northern facing buildings and windows will have permanent shading to protect from the summer sun. Landscaping will be utilised in out door areas.	✔
Roof and Wall Colour Use lighter, more reflective colours for external walls and roofs to reduce heat gain in summer.	Reflective weather resistant light coloured paints and surface coatings will be utilised on all buildings.	✔
Windows & Glazing • Areas of glass to the east, west and south should be minimised. • Windows should be double glazed as a minimum. • Glazing for office spaces should be tinted to minimise heat gain through the glass and eliminate glare within the office space. • Windows should be selected for functional purposes only, either to provide natural lighting or access to a view or to enhance the streetscape. • Heat absorbing glass should be used in commercial office buildings. • Window frames should have low thermal conductivity. • To reduce the heat flow arising from a temperature difference across the glass, the U value shall be reduced to at least 6.	The main areas of glazing will be on the office component of the warehouses. These have been sited to minimise east/west exposure to the maximum extent possible All windows to be 9mm double glazed or similar for all buildings. Office spaces will have tinted windows to minimise heat gain. Glazing and windows will be selected for their functionality. The application and use of heat absorbing glass will be used in all office components. Window frames will be of aluminium construction.	✔

DCP Provision	Design Response	Compliance
	The U value will be 6 or greater.	
3.3 Heating, Ventilation & Air Conditioning (HVAC)		
Planning & Design • The usage patterns, orientation and location of a building's occupants should be considered in the initial design of space heating and cooling. • A combination of passive methods such as direct solar access, window glazing, window shading, appropriate insulation and sealing and entry design (ie air locks, rotating doors) and natural ventilation can be used to reduce the overall use of mechanised systems. • In industrial units and warehousing, goods doors should be located or adequately partitioned away from areas that may require mechanised heating or cooling	Passive and artificial heating will be used throughout the buildings. These involve both direct solar access and insulation. In warehouse areas, mechanical ventilation will be used where passive ventilation cannot.	✔
Air Conditioning • Air conditioning systems should be well insulated, particularly those systems located in roof space. • Air conditioning ductwork and pipework should be designed to achieve low pressure drops within the constraints of the building which will minimise the pumping and fan energy consumed by the reticulation systems. • The main areas of energy wastage in air conditioning systems have been found to be excessive operating hours, malfunction of the outside air/economy cycle, overlapping between heating and cooling and absence of routine maintenance. • Air conditioning should be controlled by thermostats located within the air condition spaces. • Small office buildings can be air conditioned by reverse cycle air conditioning units. Reverse cycle air conditioning units can be controlled individually and operated independently of the rest of the building if needed out-of-hours. • Large buildings should consider central plant/gas chilling depending on life cycle costs. • Central plant areas can have a coefficient performance of 5 or 6 with gas heating.	The building is to be designed to be naturally ventilated where appropriate and possible, with the addition of air conditioning providing supplementary ventilation and temperature control. Warehouses will have permanent roof venting. Air conditioning systems will be on timer controls with operation only in peak temperature conditions. Thermostats will be on all systems to control the flow and temperature in air conditioned areas.	✔
Heating, Ventilation & Air Conditioning (HVAC) HVAC systems should be designed to minimise energy use. Points that should	HVAC systems will be designed in accordance with owners' needs. In the main, warehouses	✔

DCP Provision	Design Response	Compliance
be considered include: • set energy targets for the HVAC services based on owner cost expectations and building services expected life; • the minimum amount of plant should be operated to provide acceptable space conditions when use out of normal work hours is necessary; • providing sufficient energy metering and switching for energy management; • use separate systems to condition spaces which have different hours of use; • install optimum stop/start controls to allow the system to reduce its operation to the minimum time required to achieve the required conditions; and • ensure that the building is sealed against infiltration through windows, doors, lift shafts, and ductwork.	will not be air conditioned or heated, and will be naturally vented by the use of roof extractors or similar devices. Plant will be designed to operate only when necessary and will include energy metering/switching controls to reduce energy use when low occupancy occurs. All buildings will be appropriately sealed to reduce heat/cool air loss particularly the office components of the development.	
Carparks Where natural ventilation of carparks is not possible, mechanically ventilated carparks shall install CO monitors and variable speed drives to ensure that the fans will only run at full capacity when needed yet maintaining an air change rate through the carpark during periods of low usage.	All car parks will be open air and/or naturally ventilated.	✔
Toilets • Toilets shall be provided with a variable speed drive to the toilet exhaust system. • Occupancy sensors shall control a motorised damper in each toilet area to allow ventilation of the toilets when they are in use and close the damper in each toilet area after a set time period of no occupancy to prevent unnecessary ventilation.	Toilets will have variable speed drive exhaust systems, with occupancy sensors to control the motorised damper in each toilet area. Exhaust systems will be in operation only when the toilet areas are in use and automatically close after a set period of time.	✔
3.4 Lighting		
Planning & Design • Artificial light should only supplement natural light when required during the day and ideally be sophisticated enough to adjust to different lighting levels in different areas due to distance from windows and changing external light levels. • The extent of lighting should be relative to the use of different areas. For example high lighting levels should be provided for workstations and service areas. • Controls shall be fitted to ensure that lights are not left on when not	Artificial lighting will be required and will be of energy efficient fixture and installations. Typically up-lighting, compact fluorescent down lighting, desk lights and the like. Warehouses will have skylights in at least 10% of the roof area and lights will be linked to photo-electric dimming. Average Lighting Power Density to be used is as follows: ▪ *Offices* ¼ 12 W/m2	✔

DCP Provision	Design Response	Compliance
required. Types of lighting control devices include time switches, photoelectric switches, time delay switches, automatic daylight controls, proximity sensors, and infra-red signallers. • Occupancy sensors shall be provided in areas which remain unoccupied for significant periods of time such as boardrooms, storerooms and toilets.	▪ *Warehouse* ¼ 3.5 W/m2 per 100 lux Controls to be fitted to ensure that lights can be powered down when left on and when not required. These controls include time switches, photoelectric switches, time delay switches, automatic daylight controls, proximity sensors, and infra-red signallers. Occupancy sensors shall also be provided in boardrooms, bathrooms and storerooms.	
Electric Lamps • Incandescent lamps are most appropriate for operation where the electric lighting is required only occasionally (less than 3 hours per day); dimming or frequent switching is required and the relatively short life is acceptable. • Fluorescent lamps are preferred when electric lighting is required for long periods; large areas need to be lit, at low mounting heights; high luminous efficacies are required; and precise optical control is not required. Fluorescent lamps should be T8 triphasers or T5s and the low loss or electric ballasts should be used. • High Intensity Discharge lamps have very high luminous efficacies; large wattage ranges from less than 100 to up to 3kW and very long life. However, they have a high initial capital cost, 5 to 10 minute delay before full light output and poor colour rendering properties. Metal halide is preferable to mercury vapour where colour is important or high pressure sodium if colour rendition is not important.	Fluorescent lamps will be used where electric lighting is required (nominally in the office areas). In warehouse areas high intensity discharge lamps will be used where fluorescent lamps are not practical. High intensity discharge lamps will be used in the warehouse components of the development.	✔
Emergency, Security and External Lighting • Emergency lighting components must comply with Australian Standard AS2293.1. • External lighting can be segregated into access and security lighting, both of which cannot be activated until a photoelectric cell (PE) senses night time. • External lighting (other than security) shall be solar powered.	All buildings will have emergency lighting components for egress in compliance with AS2293.1 External lighting will be segregated into access and security lighting which will not be active until night time through the use of photoelectric cell sensors. External lighting (other than security lighting) will be solar powered with electric backup.	✔
3.5 Water		
Hot Water Heating • Hot water heating can be a significant greenhouse gas generator for commercial and industrial developments. • Gas systems are generally better than all electric systems except heat	Hot water heating would be used in the office component (typically building kitchenettes and ablution areas) and would be gas systems.	✔

DCP Provision	Design Response	Compliance
pumps and that the most efficient systems are gas-boosted solar. Further, gas systems are comparably priced with continuous supply electric systems with regard to up-front and on-going costs. • To increase efficiency, water heating systems should be positioned close to the major points of use such as the kitchen. • Hot water systems should have thermostatic controls and the hot water tanks and pipes should be well insulated.	All hot water systems would have thermostatic controls with pipe work and ducting insulated. They would be located in close proximity to kitchens and change rooms/toilets.	
Water Usage • Install AAA rated water efficient shower heads and water tap fittings for basins and kitchen sinks. • Install dual flush toilets. • Capture and reuse stormwater on-site where possible for non-potable uses such as landscaping, washing water or toilet flushing. • Install appropriate irrigation systems that reduce water consumption. • All developments over 1000m2 need to address the potential for re-use of stormwater on the development site and any proposed impacts on the hydrology of the surrounding locality.	Water fittings such as tap, shower and basin fittings will be AAA rated. All toilets to be dual flush and where possible, waterless urinals shall be installed. A rainwater harvesting tank (size to be determined) will be installed for all buildings to recycle stormwater from the roof which will be used for non-potable uses including watering of landscaping. A flood assessment has indicated that such a scheme will be beneficial in terms of reducing flooding impacts in the catchment. The site will utilise, as far as practicable, treated water from the Orica GTP on the BIP for non-potable uses. This will include any potential industrial uses that may have high water demands. Landscaping areas will be predominantly native species tolerant of local conditions. Drip irrigation systems will be used as necessary. The site will also incorporate water sensitive urban design (WSUD) measures including the use of GPT/trash racks on key stormwater lines. Other WSUD measures such as bio-filtration are not appropriate at this site. Groundwater extraction and remediation works will continue at the site which lower groundwater levels. The recharge of groundwater is not, therefore, appropriate at Southlands.	✔
3.6 Appliances		
• The use of energy efficient electrical appliances in commercial and industrial developments can result in major energy cost savings. • The energy star feature should be enabled on all office equipment, such as computers, printers, photocopiers and fax machines. • Appliances which give off high degrees of heat should be separated from the main work areas.	All appliances are to be energy efficient and have enabled the energy star feature. Where appliances will give off high levels of heat, these will be separated from main work areas. Should there be a requirement, cooktops and kitchen equipment shall be energy efficient and meet industry standards.	✔

DCP Provision	Design Response	Compliance
• Businesses which involve food preparation and/or sales of food should use energy efficient appliances such as cook tops and refrigerators. • The internal layout of shops shall ensure cooling devices such as fridges and freezers do not receive direct sunlight which would place additional load on such equipment. • AAA rated water efficient dishwashers and washing machines should be installed in all new commercial and industrial developments.	Should there be a requirement, buildings that house cooling devices such as fridges and freezers will not be placed in direct sunlight, thereby minimising load. Where provided, AAA rated water efficient dishwashers would be installed.	
3.7 Landscaping		
Landscaping can improve the thermal performance of a building through seasonal variations in solar access, shade and shadows, providing wind breaks and channeling or deflecting breezes. Possible design solutions to maximise thermal performance of a building through landscaping include: • Tall trees with high, wide canopies and bare trunks will shade a roof but not walls and windows. However, care should be taken to ensure they do not grow tall enough to shade solar collectors to the south. • Vines and creepers can provide an insulative effect if planted close to a building. • Select plantings with low maintenance and low water consumption. • Street tree species should be selected in accordance with Council's Street Tree Register to provide summer shading while not impeding solar access to dwellings in winter. • Deciduous trees to the north, east and west will shade the building in summer and help keep it cool. In winter, without leaves, deciduous trees will allow sunshine to warm the building. There are potential conflicts between the principles of ESD, biodiversity and the use of non-indigenous deciduous trees which also require managing of leaf drop issues. Consult Council's Parks Department for guidance on landscaping issues. • Install a tap timer and drip irrigation system for watering the garden rather than using a hose or a sprinkler.	Landscaping will include a palette of native trees, shrubs and groundcovers that will be designed to enhance the development as well as providing thermal protection. These will also be tolerant of local conditions. Where practical, areas will be landscaped to provide natural shading and provide wind breaks and channelling. The use of trees and hedges will be provided where suitable. Low maintenance and low water consuming vegetation will be used for all landscaped areas in order to minimise water usage. Predominant use of native species endemic to the area. Street trees will be in accordance with Councils street tree register and provide summer shading. All irrigation systems to be timer controlled drip irrigation.	✔

3. Concluding Statement

The proposed development of the Southlands site provides opportunities for the implementation of industry best practice water and energy efficiency measures. The proposed development has been assessed under the City of Botany Bay Energy Efficient Development Control Plan to demonstrate compliance with local controls.

As the buildings on the site have not been designed, total emission reductions cannot be calculated at present. However, the key considerations relating to emission reductions revolve around:

- Using solar access for beneficial purposes and minimising solar shadowing of adjoining properties.
- Incorporating energy efficiency in buildings through design and fixtures.
- Incorporation of natural ventilation as a passive cooling strategy.
- Incorporating water sensitive urban design measures into the development, undertaking beneficial rainwater harvesting and potentially using treated water from the Orica Groundwater Treatment Plant (GTP) located on the adjacent Botany Industrial Park (BIP).

The proposal will incorporate these measures to ensure compliance with the City of Botany Bay Development Control Plan and will thereby achieve energy reductions/savings and reduced emission potential.