Sirius Site

2-60 Cumberland St, The Rocks

ESD Report

October 2020

Prepared for:

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EXECUTIVE SUMMARY

The Sirius building is being redeveloped by applying adaptive reuse strategies to provide a total of 76 residential apartments with a supplementary component of retail and commercial on the ground plane. This proposal includes approximately 7,010sqm of retained structure and an additional 1,290sqm of new build. This project has focused on creating exemplar for adaptive reuse and delivering a sustainable outcome that provides environmental benefits as well as health and wellbeing benefits for the residents and minimise impacts on the surrounding community.

This report presents the sustainability strategy for the project. The Sirius building is located in The Rocks district of Sydney between the Harbour Bridge and Circular Quay. The existing building was developed in the 1970's and the prominent concrete structure is considered to be a strong representation of brutalist architecture.

The adaptive reuse of the existing structure is the key sustainability priority for the project. This has a significant sustainability benefit:

Most importantly, it delivers a reduction in embodied energy of greater than 80% or over 8,000 tonnes of CO2eq emissions. This is equivalent to a forest the size of the entire Sydney CBD.

a) It reduces community disruption through reduced transport impact on site both in removing spoil and delivering replacement materials.
b) It retains community links with the existing architectural form.
c) It delivers a thermally massive form with optimal potential for cross ventilation, creating the potential for significant energy reductions to maintain thermal comfort when compared to standard practice new build residential in Sydney.
d) It provides the city with an exemplar adaptive reuse project in the residential sector.

Beyond retaining the adaptive reuse, the redeveloped building is seeking to deliver best practice sustainable design elements including:

- A materials red list
- 100% LED lighting
- Efficient heating and cooling systems that eliminate visible heat rejection units
- Next generation transport facilities including EV charging and e-bike facilities.

1. INTRODUCTION

1.1 Approach to ESD and Sustainability

The sustainable design of the redeveloped Sirius building has prioritised adaptive reuse of the existing form and structure. This approach, whilst limiting opportunities in other areas of sustainability such as use of modern building fabric and planning to optimise orientation and accessibility, creates an opportunity to deliver an exemplar development that demonstrates what is possible in applying sustainability within the existing urban fabric.

This report identifies the key strategies proposed for the project to reduce energy consumption, minimise potable water demand and avoid waste to landfill.

1.2 The Project

The proposed development is for the restoration and refurbishment of the existing Sirius building, including alterations and additions. The existing building is proposed to be substantially retained and restored with integrity. New residential additions are proposed to be added to the existing structure in appropriate locations to maintain the legibility of the original architectural form, and new structures for commercial uses are proposed to be added at the Cumberland Street and Gloucester Walk frontages of the site.

The existing Sirius building has a varied height profile due to its modular form and due to the fall across the site when observed from Cumberland Street and from Gloucester Walk. The existing building rises from the north and south towards a central tower with a maximum height of 34.6m above ground level at Cumberland Street (equivalent to an 11-storey building). Due to the existing split-level apartments, the building is conveyed as having a greater number of levels (25 storeys).

The proposed alterations and additions to the existing building will increase the overall building height by 5.4m to a maximum building height of 40.9m above ground level at Cumberland Street. On the Cumberland Street entry side of the site, the building presents as thirteen (13) levels at the highest occupied level. When observed from Gloucester Walk, and due to the fall across the site, the building presents as fourteen (14) occupied levels.

The building incorporates two levels of basement car parking.

The proposed works include:

- Alterations and additions to the existing building to provide for:
    - Residential accommodation (a total of 76 apartments);
    - Commercial premises, including retail floorspace; and
    - Basement car parking.
- Provision of a through-site link between Cumberland Street and Gloucester Walk.
- Upgrades to Gloucester Walk including landscaping and pedestrian access.
- Improvements to Cumberland Street including landscaping and improved carpark entry.
- Associated works, including:
- Minor demolition works;
- Earthworks;
- Structural upgrades;
- Services upgrades; and
- Landscaping works.

1.3 Location and Climate

The project is within the historic Rocks district of Sydney between Circular Quay and the Southern off-ramp of the Sydney Harbour Bridge. The building is generally exposed to the unique microclimate that occurs close to the harbour including cooler, more stable temperature and sea breezes.

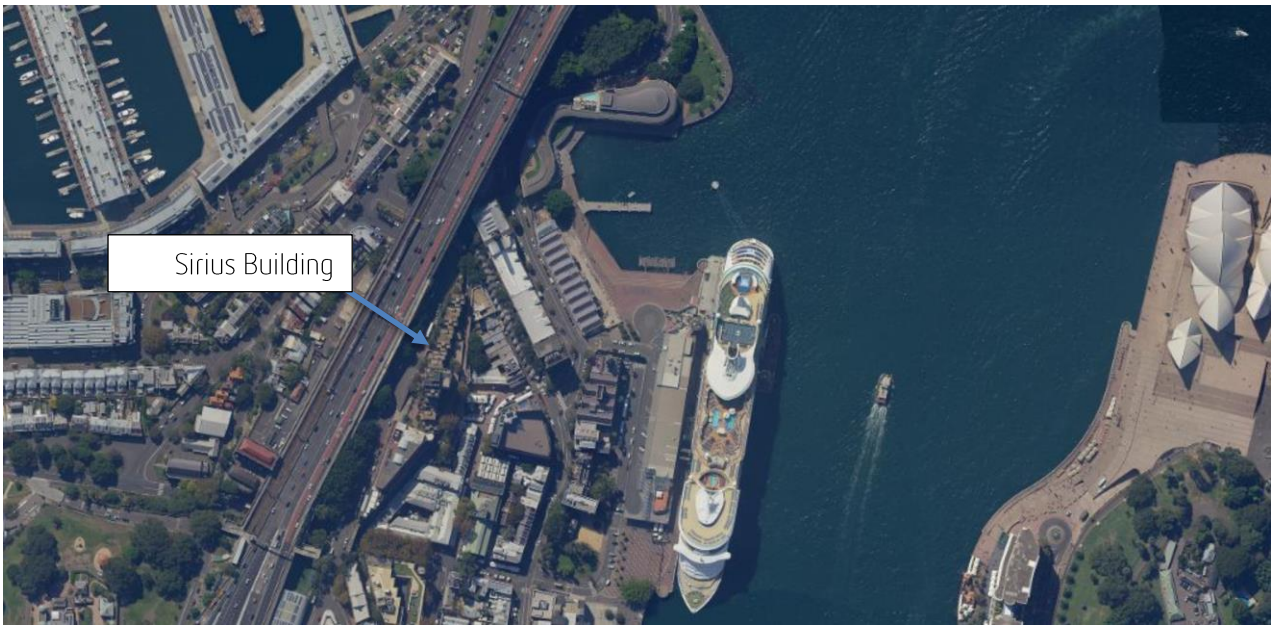
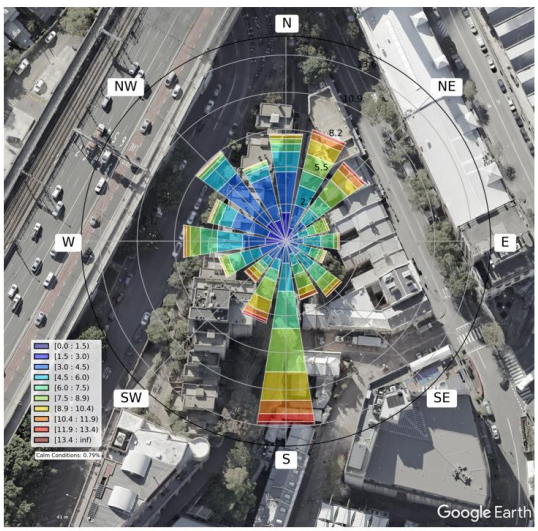


Figure 1 - Project Location

Local climate analysis has been performed to understand the passive design opportunities for the site and inform any renewable energy generation strategies.

All wind speeds



25th percentile

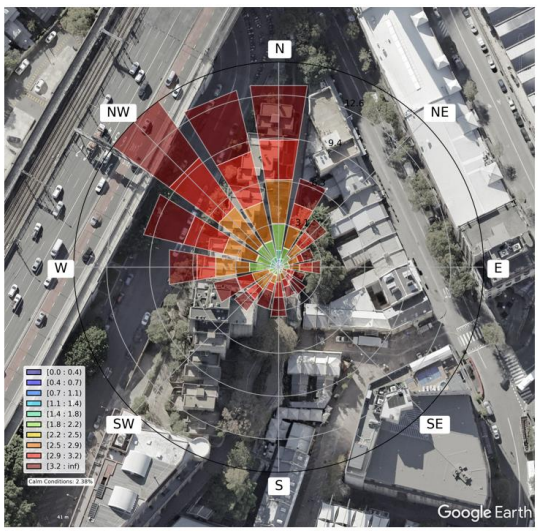


Figure 2 - Annual wind rose, All hours (left), Lowest 25th percentile (right)

The charts above show the wind rose for all wind speeds and the lowest 25th percentile. They indicate that the existing building is ideally oriented for natural ventilation. They are well sheltered from the dominant southerly wind direction and seek to harvest the limited breezes from the NW during low wind conditions when natural ventilation is more applicable and necessary.

The localised harbour impacts will additionally generate NE breeze in summer and spring (shown in the diagrams below). This will assist in maintaining comfort in the lower apartments sheltered from the NW by the bridge off-ramp.

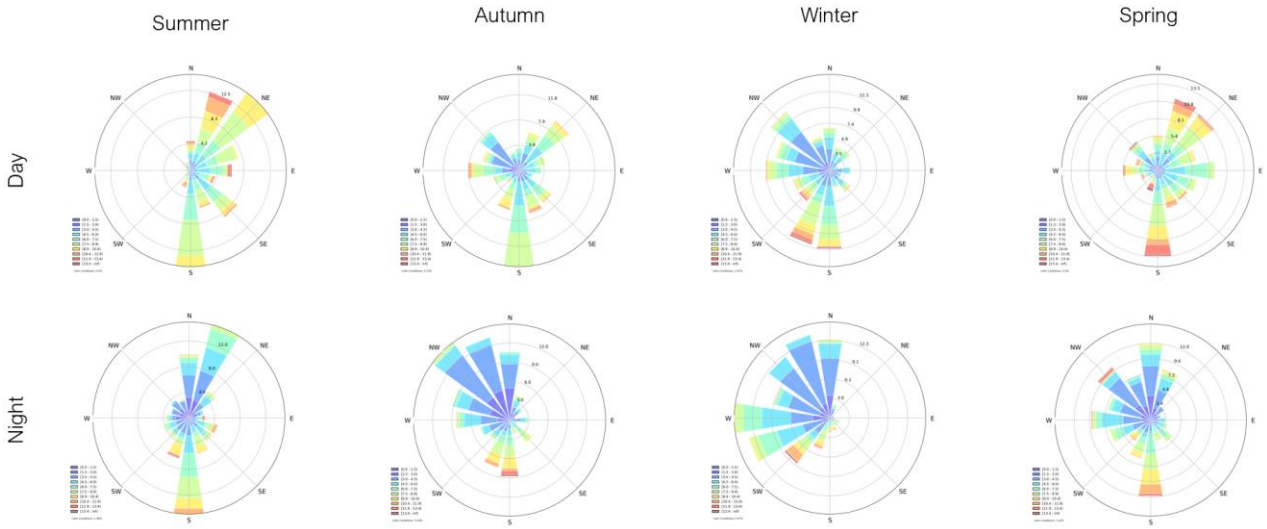


Figure 3 - Monthly wind rose (all hours)

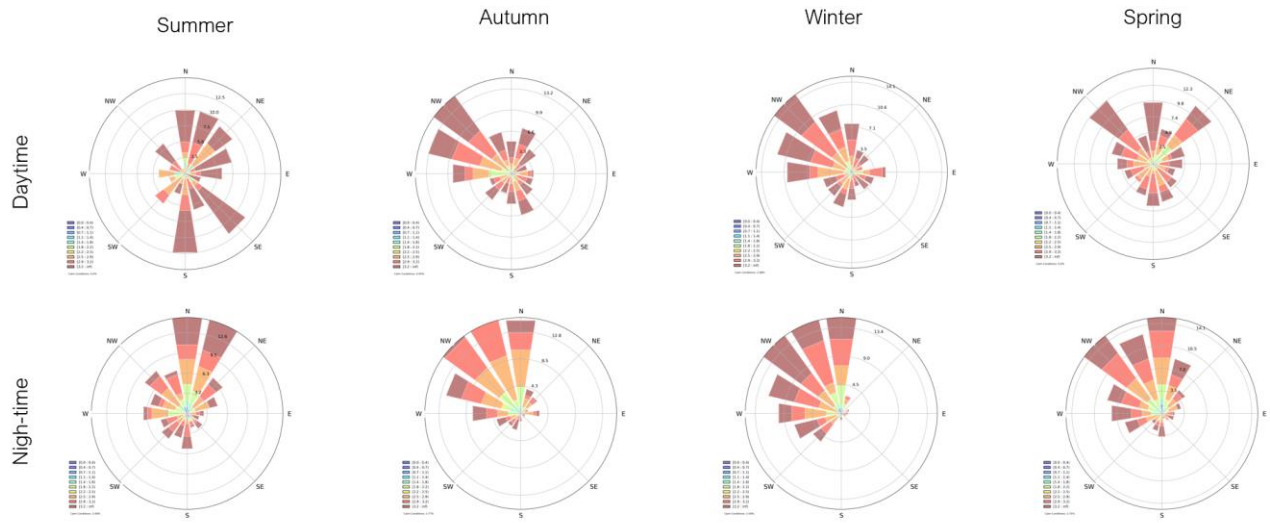


Figure 4 - Monthly wind rose, Lowest 25th percentile

Solar radiation analysis has also been performed (shown in the diagrams below). The analysis shows the roofscape provides an ideal platform for harvesting solar energy.

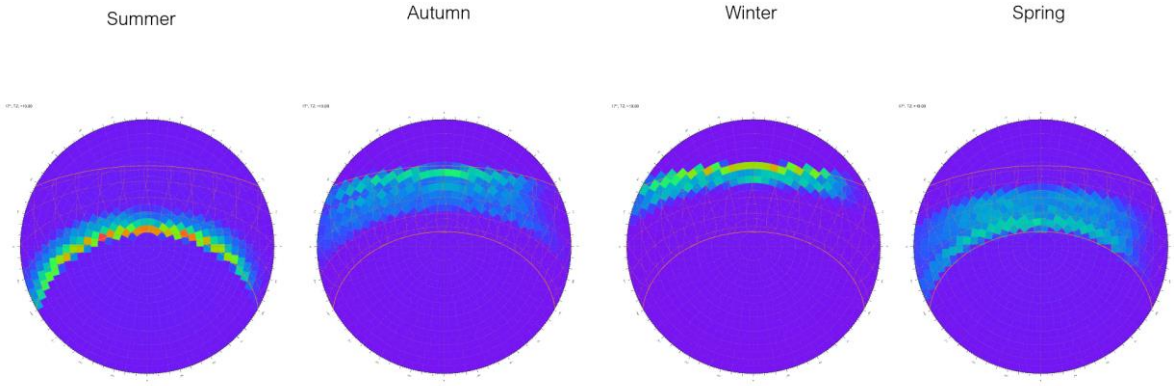


Figure 5 - Solar access to roof (by season)

1.4 Limitations

This report has been prepared for planning approval. Final performance of design elements will be subject to actual equipment selections, design optimisation, controls and actual utilisation.

2. Secretary's Environmental Assessment Requirements

The overall ESD design strategy for the site and its buildings has been developed to respond to Section 13 of the Secretary's Environmental Assessment (SEARs) Requirements named "Ecologically Sustainable Development (ESD)". The design ESD strategy responds to the following elements within SEARs:

Requirement	Response
Identify how the development will incorporate ESD principles (as defined in Clause 7(4) of Schedule 2 of the Regulation) in the design, construction and ongoing operation phases of the development, and include innovative and best practice proposals for environmental building performance	Refer Section 3 and 4 of this report.
Include a framework for how the future development will be designed to consider and reflect national best practice sustainable building principles to improve environmental performance and reduce ecological impact. This should be based on a materiality assessment and include waste reduction design measures, future proofing, use of sustainable and low-carbon materials, energy and water efficient design (including water sensitive urban design) and technology and use of renewable energy	Refer Section 3 and 4 of this report.
Use the climate change projections developed for the Sydney Metropolitan area to inform the building design and asset life of the project and address impacts including: o increased frequency of extreme heat days o extended heatwave events o more extreme (intense) rainfall events.	Rainwater system has been designed to future climate projections. The existing retained structure and resultant built form is not considered susceptible to future climate impacts. Any residual risks will be identified in a climate change risk review prior to construction. Medium level risks will adopt mitigation measures to be reduced to low level.
BASIX Certificate and NABERS assessment	BASIX compliance is achieved for the residential development. BASIX certificates are provided as a separate attachment to the EIS. As BASIX is the primary tool to drive ESD compliance of the residential which forms the bulk of the development, NABERS is not applicable to the remainder non-residential component.

2.1 Section J and BASIX Compliance

The residential spaces have been designed to comply with BASIX. Refer to BASIX certificates attached to the EIS.

3. SUSTAINABILITY INITIATIVES

3.1 Proposed Sustainability Initiatives

Central to the projects proposal to redevelop the Sirius Building is the prioritisation of the adaptive reuse of the existing built form as a sustainability initiative. This is complemented by a range of other best practice initiatives scheduled below.

Sirius Schedule of Sustainability Initiatives		
Item	Included in Design	
Retained Structure	Y	The adaptive reuse of the Sirius building remains a centrepiece of the project's sustainability strategy, reducing embodied carbon, waste and truck movements through the city.
Materials Red List	Y	The materials red list included within this report will be applied during the detailed design and construction phase of the project.
100% LED Lighting	Y	All lighting used throughout the project is to be LED.
Efficient Heating and Cooling	Y	A central chilled water and heating water system will be used in the project to provide the most efficient form of active air-conditioning to the apartments. This eliminates visible heat rejection units from the design.
Lighting control system	Y	A lighting control system will be provided to the base building.
Occupancy sensors in enclosed spaces	Y	All enclosed spaces (plantrooms, bin rooms etc) will be provided with occupancy sensors.
Daylight sensors in naturally lit rooms	Y	Daylight sensors will be installed in naturally lit rooms to permit active dimming.
Per apartment electricity metering and monitoring system	Y	Electricity metering will be installed on a per apartment level to permit owners to monitor usage.
Climate change risk assessment	Y	A climate change risk assessment will be performed on the developed design prior to construction. Given location and the adaptive reuse of the structure no significant risks that will impact the core design of the building are anticipated.
Climate change impacts - rainfall, hail	Y	Rainwater system will be designed to cope with future projections for rainwater and hail to prevent plockage and system failure.

Rainwater Collection - 90% of rainfall over a 10 year period	Y	A 5000L rainwater tank has been incorporated into the project to meet the project rainwater demands.
Purple pipe reticulation to non-potable occupant demands and landscape	Y	Non-potable and landscape demands will be provided with a purple pipe connection for rainwater use.
Highest star rated WELS (Water Efficient Labelling Scheme) Fittings	Y	All hydraulic fittings and fixtures are highest available within the class of product for the project.
Water Metering with centralised online reporting and leak detection	Y	Water metering is included in the design and this will be connected to an online reporting system for leak detection.
Cyclist facilities for all residents	Y	All residents are provided with access to cyclist facilities
10A Charging outlet for each cycling space	Y	A standard 10A powerpoint will be provided
15A Charging outlet for each car space	Y	A standard 15A powerpoint will be provided
Construction EMP	Y	To be implemented prior to commencement of construction
Onsite Waste separation	Y	To be implemented prior to commencement of construction
90% waste diversion from landfill	Y	To be implemented prior to commencement of construction
Onsite Solar	Y	Rooftop solar forms a key integrated element of the roofscape design and will provide a visible sustainability element for the project.

4. MATERIALS

4.1 Adaptive Reuse

An assessment has been undertaken on the sustainability benefits of retaining the structure of the existing Sirius Building. The most significant benefit of retaining the structure relates to construction phase impacts. Specifically, less embodied carbon, less waste and less community disruption. In order to assess the embodied carbon benefit a desktop analysis has been conducted comparing the expected embodied carbon of a demolish and rebuild option with that of a retained structure. A further analysis had been conducted to reflect a best practice construction methodology including the use of fabricated steel balcony and façade elements and efficient transport methods. The analysis for the demolish and rebuild case adopts industry accepted embodied carbon values for residential development in Sydney. These values have been used equally in the retained structure case as applicable. The analysis is based on inbound, or new, materials used on site. Demolition of internal structure associated with reconfiguration of apartments is accounted for within the internal finishes allowance.

The results of the analysis are presented below.

	(UNITS)	NEW BUILD	PROPOSED	
RETAINED GFA	sqm		6,538	
NEW GFA	sqm	8,419	1,881	
DEMOLITION OF STRUCTURE	t CO2	1,030		
CONCRETE	t CO2	2,314	517	
REINFORCING STEEL	t CO2	2,419	540	
FAÇADE	t CO2	1,170	261	
INTERNAL FINISHES	t CO2	1,153	258	
ONSITE CONSTRUCTION	t CO2	421	94	
TRANSPORT	t CO2	946	211	
TOTAL		9,453	1,882	
REDUCTION IN EMBODIED ENERGY				80%

Retaining the structure and the proposed best practice construction initiatives reduces the embodied carbon within the development by 80%. This saving is the equivalent of planting a forest the size of the Sydney CBD.

Additional Benefits:

- Reduced community disruption: eliminating the demolition phase of the project shortens overall construction time and reduces truck movements through The Rocks in both the carting away demolition spoil and delivering new materials to site. There is also a significant reduction in noise and vibration.

- Retained community links: The existing brutalist form is a highly visible element at one of the key gateways to Sydney, both in the form of regular day commuters arriving over the Bridge from the North and international visitors arriving by ship. The Rocks being one of the most important tourism destinations in Australia. The existing structure provides an important reference point assisting in placemaking and orientation as well as providing an essential role through site link for pedestrians travelling between The Rocks, the Sydney Harbour Bridge and Observatory Hill.

- Thermal Mass: The thermally massive form with relatively shallow floorplates delivers optimal potential for cross ventilation, creating the potential for significant energy reductions to maintain thermal comfort when compared to standard practice new build residential in Sydney. Modern developments almost universally adopt lightweight, highly glazed facades with deeper floorplates, increasing thermal loads and reducing natural ventilation effectiveness.

4.2 Materials Red List

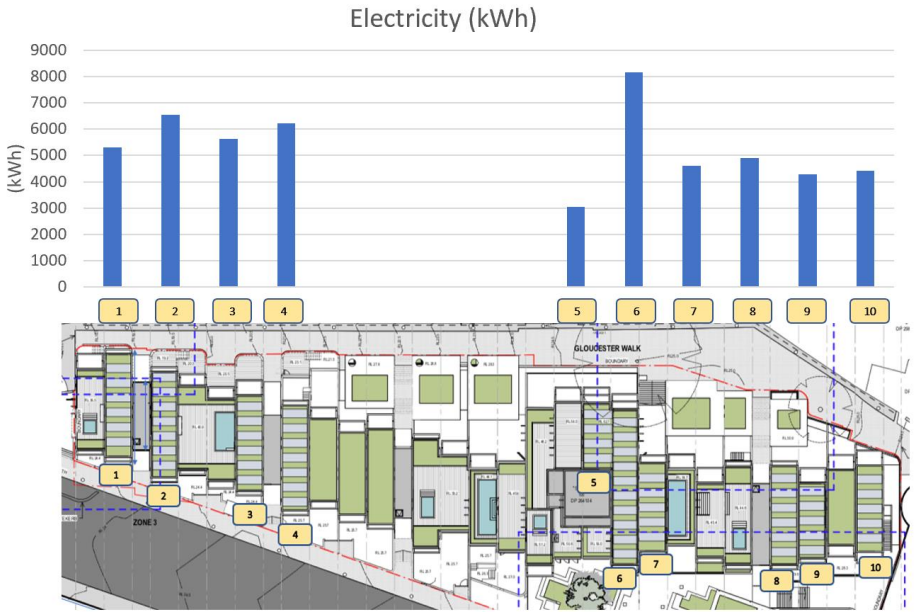
The project is proposing to apply a materials red list that has been informed by the Living Building Challenge and local materials context. This is scheduled below.

Material / Chemical	Common Products	Minimum Target	Goal
Asbestos	Insulation, Fire Spray, Compressed Board	Prohibited. Existing material detected on site to be fully removed (not contained) from site and certified by a hygienist.	
Formaldehyde	Composite products, glues and adhesives	Low formaldehyde emissions certification E0 or better (refer Green Star for requirements)	Zero formaldehyde
Ozone Depleting Gasses (inc CFCs and HCFCs)	Refrigerants, Insulation (including manufacture)	Prohibited	
PVC	Flooring, drainage pipes, Conduits, Cable Insulation	No PVC used where viable alternatives exist (eg fire rated cables, flooring). Where PVD is used, Best Practice recognised product will be selected.	Zero PVC
Sealants	Paints, sealants, adhesives	TVOC content within limits nominated by appropriate rating tools (eg Green Star)	
Timber	Framing, composite boards, surfaces and veneers.	FSC (Forest Stewardship Council) Certified or post consumer recycled.	
Aklylphenols	Fire retardants	Prohibited	
Bisphenol A	Paint	Prohibited	
Cadmium	Flooring, paint	Prohibited	
Chlorobenzenes	Sealants, solvents	Prohibited	
Chloroprene (neoprene)	Adhesives, sealants		Prohibited
Chromium VI	Paint, primer, concrete manufacturing	Prohibited	
Lead	Paints	Prohibited	
Mercury	Light fittings	Prohibited	
Polychlorinated biphenyls (PCBs)	Transformers, light ballasts	Prohibited	
Perfluorinated compound (PFC)	Fire services, packaging, water resistant treatments	PFC's eliminated from all building services and architectural finishes.	Zero PFC's
Phthalates	Vinyl flooring	Prohibited	
Timber preservatives (creosote, arsenic, pentachlorophenol)	Preserved timber	Prohibited	

5. ENERGY

5.1 Solar Energy

The roofscape of the Sirius building provides an ideal location and orientation for harvesting solar energy within a PV array. This array is an integral part of the design which incorporates the panels amongst green landscape elements.



- Total electricity yield – 53,143 kWh/year
- Total AC capacity – 37.8 kW

PV Region	Num. Pv Modules (n)	Total Module Area (m2)	Inverter Number (n)	Nameplate DC capacity (kWdc)	Total AC capacity (kWac)	Total Inverter Capcity (kWdc)	Electricity Yeild (kWh)
1	12	19.8	1	4.202	3.85	3.967	5317
2	14	23.1	1	4.902	3.85	3.967	6537
3	12	19.8	1	4.202	3.85	3.967	5629
4	14	23.1	1	4.902	3.85	3.967	6208
5	8	13.2	1	2.801	2.53	2.627	3049
6	20	33	1	7.004	6.9	7.2	8147
7	10	10	1	3.502	3.04	3.136	4620
8	12	19.8	1	4.202	3.85	3.967	4912
9	10	16.5	1	3.502	3.04	3.136	4293
10	10	16.5	1	3.502	3.04	3.136	4430
Total	**122**	**194.8**	**10**	**42.721**	**37.8**	**39.07**	**53142**

The project can accommodate approximately 200sqm of PVs. This will deliver an annual electricity generation of 53,143kWh or about 50t of GHG savings. This is expected to meet 10% of the project's annual energy demands.

5.2 Gas Microturbines

In order to reduce the projects peak load and dependency on the grid, gas microturbines are integrated within a basement plantroom. This strategy will provide low carbon electricity to the project and additional capacity during peak load events, increasing project resilience. The microturbines will additionally provide waste heat for domestic hot water.

In order to futureproof the project the plantroom sizing has been confirmed to be suitable for future retrofit of batteries once the technology has matured sufficiently for in-building application at this scale of development. Whilst in home batteries are well developed, batteries and control system supplying multiple strata apartments currently require further development. It is expected that once the turbines reach end of life and potentially at the first major service interval of the turbines (~10 years) a battery retrofit will likely be the commercially preferred option.

6. CONCLUSION

The Sirius building has maintained its commitment to providing an exemplar adaptive reuse project and is providing a suite of energy, water and waste strategies to complement this to both ensure high performance upon completion and resilience through the life of the project.

The application of on site PV's integrated within the roofscape provides a highly visible sustainability element and less visible elements such as the rainwater tanks and gas microturbine provide demonstrable sustainability benefits that help futureproof the building and ensure it remains a valuable asset to the city into the future.