Full Circle
Design Services

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55 Kishorn Road

Sustainability Strategy

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Description:	This report provides the ESD strategy for the proposed multi-residence development at 55 Kishorn Road in Mount Pleasant The project includes a single building with 24 high-quality dwellings, with an expected peak population of around 71 residents and three commercial office staff. The design is targeting best practice sustainable design features across a range of assessment categories including renewable generation, thermal performance, embodied energy and sustainable transport.

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Executive Summary

The following document provides a brief description of the sustainable design features expected from the various design disciplines for the proposed 55 Kishorn Road project.

The design includes 24 high quality dwellings over seven occupied levels, with an office at ground level and a communal lounge and outdoor area at roof level.

Considering the nature of the project, local infrastructure limitations, proposed location, the project team have developed four key sustainable design themes which support the project's value proposition and add to the experience for owners and occupiers:

- Healthy living
- Minimised carbon footprint
- Sustainable transport
- Future resilience

Supporting these themes are a range of sustainable design features and inclusions which will provide verifiable performance improvement over current business as usual design and construction practices. These features include:

- Bike parking and EV facilitation
- Improved building envelope
- Performance verification at completion
- Native planting and water efficient design
- Onsite photovoltaic array and potential for batteries
- Photovoltaic array and batteries on site
- Construction on a previously developed site
- Low carbon construction
- Zero carbon transition plan

The project is expected to require gas due to limitations in local electrical infrastructure, preventing a formal Green Star certification, however, has used Green Star benchmarks and has proposed clear means for performance verification at major milestones.

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1. Introduction

FCDS have been commissioned to assist the 55 Kishorn Road design team in developing and implementing a holistic sustainable design strategy which meets best practice design outcomes and provides verifiable performance metrics for external review and comment.

This report presents the proposed ESD themes the project has elected to pursue and outlines key design features to deliver measurable performance against these themes.

1.1 Project Description

The design includes 24 high quality dwellings over seven occupied levels, with an office at ground level and a communal lounge and outdoor area at roof level. Specific project inputs are as follows:

Project Location:	Kishorn Road Mount Pleasant	Contract Value	>$10M
Total GFA:	~2,500m^2		
Occupied Areas:	~4,000 m^2 Residential	~100m^2 Common / Commercial Areas	
Occupants:	~71 Residents	3 Staff	5 Visitors

The design team will be targeting high performance materials to optimise occupant thermal comfort, provide cross flow natural ventilation, exceptional levels of natural light and low operating carbon emissions.

1.2 Existing Site

The site is currently developed, close to the Mount Pleasant foreshore and numerous local amenities. The new development can improve urban heat island outcomes with lighter colours and improve pedestrian connections.



Above: Lot Location (Google Maps)

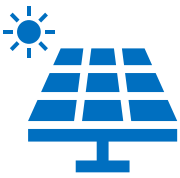
1.3 Strategic Project Aims

In progressing this development, the project team are keen to deliver best practice sustainable design outcomes. As part of this commitment, the project team has selected the following key sustainable design themes for the project. Design features, aligning with national best practice, have also been proposed as a means to demonstrate the project has met its intended outcomes:

- Healthy living
  - The design should promote occupant health and wellbeing, both through internal design decisions and access to external spaces.



- Minimised footprint and operational costs
  - The design must ensure that operational utility use – such as energy and water – are minimised, with long life cycle products and low carbon technology where possible.
  - The development should minimise impacts to nature and local ecology.



- Climate resilience and future focus
  - The development has a design life of in excess of 50 years. The final product must provide high performance in current climatic conditions, with flexibility and resilience to suit weather patterns in 2080 and beyond.

- Sustainable transport
  - The location of the project can assist occupants in reducing their dependence on cars. Integration and facilitation of sustainable transport options is key for project success.



1.4 Owners Project Requirements

The following table provides a summary of general performance targets the project intends to adopt:

Category	Target	Initial Targets
Energy Consumption	10% Improvement over BCA – Envelope	- Roof > R6, Solar Absorbance < 0.35 - Walls – R2.2 batt insulation + Thermal break - Glass – High SHGC Double Glazing, High performance frames - Floors – R1.9 Board insulation to any exposed floors
	30% Improvement over BCA - Overall	- 30% reduction in lighting power density - 15% improvement in minimum efficiency for HVAC - Electric hot water systems (central, heat pump)
	Façade leakage < 10m³/hr @ 50Pa	Design will include detailing to control air leakage and commissioning will include building pressurisation tests. DD Phase to include documented air barrier drawings. CD Phase to include air barrier penetration detailing
	Energy Source	Include electrical infrastructure to allow transition to electric site when infrastructure is available
	Renewable Energy	The project should include a large solar photovoltaic array, comprising ~36kW of panels and inverters, to produce at least 40MWhrs of electricity per annum.
Water Consumption	Low Flow Tapware	Utilise low flow tapware throughout building.
	Irrigation	Utilise low water use planting and water efficient irrigation on site.
	Stormwater Management	Minimise stormwater pollutant outflow via infiltration and swales
Waste Targets	75%+ Recycling in operation	Design to facilitate capture of recyclable goods and use of comingled recycling. Facilitate collection through nominated store with easy bin access.
	>90% Recycling in construction	Careful consideration of construction materials to avoid waste. Use of high efficiency resource recovery facility to sort waste in construction.
Material Selections	Ethical Certification	Prioritise materials which are: - Locally sourced - Ethically sourced - Renewable - Certified – GECA / FSC / Green Tag - Recycled – preferably from on site. - Durable – 10 year+ Design Life for finishes
	Embodied Carbon	Design for efficient structural performance. Select natural materials – such as timber. Minimise steel, cement and aluminium. Reduce upfront carbon by 10% against reference.
Indoor Environment Quality	Outside Air	AS1668.4 Compliance, AS1668.21 Separation
	Low VOC's	TVOC < 0.27ppm Formaldehyde < 0.02ppm

2. Healthy Living

The project is intended to support occupants keen to be a part of a healthy and active community and is well located for walkable access to coffee and restaurants, groceries, newsagents and health services.

The design includes connection to the existing pedestrian infrastructure, with pedestrian routes maintained from the street and parking sunk below ground floor level to improve engagement with the street.



Other design features to improve occupant health outcomes through the design features detailed in the following sections.

2.1 Low Toxicity Materials

Internal finishes and joinery will prioritize low toxicity through minimisation of VOCs and formaldehyde:

- Walls and ceiling paints will target Ultra Low VOC compliance (<5g/l)
- Adhesives, sealants, trim paints, primers and sealers will comply with Green Star best practice benchmarks.
- All internal joinery will be certified as low (E0 or E1) formaldehyde.

At building license stage, the design team will provide a performance specification for all relevant products and, where selected, will ensure materials meet the performance requirements above.

2.2 High Performance Envelope

The building design will prioritize the protection of glazing through the use of high-performance glazing, shading to east/west elevations and insulation.

Initial modelling of apartments has been undertaken, targeting a 7-Star outcome:

Construction Element	Insulation / Performance
External Walls	R2.2 Insulation 75mm
Floors	R1.9 Insulation – 40mm Board to exposed floors
Ceiling	R6.0 Bulk, where exposed above
Concrete Roof	Light finish or planting, 80mm R3.8 board below
Metal Roof	R2.0, Reflective insulation under roof sheets
Sliding Doors Awning Windows	High performance double glazing and frames.

Overall, the project intends to target a 7.5 Star NatHERS average rating for the apartments. This is a half star better than BCA minimum requirements and improves thermal comfort and energy efficiency. At building license, the Section J compliance report will demonstrate the performance improvement.

2.3 Natural Ventilation

The design will ensure that all apartments meet or exceed the ventilation requirements of AS 1668.4 for natural ventilation.

The building orientation will assist with access to prevailing breezes, with most units having access to dual aspect natural ventilation.

At building license stage, the mechanical designer will certify appropriate ventilation provisions for all habitable spaces.

In addition to the above, the project also intends to facilitate active transport through the integration with local footpaths and pedestrian infrastructure.

2.4 Acoustic Performance

The design is targeting best practice sustainability outcomes for the site through management of noise levels and exceeding BCA requirements for noise separation in walls and floors.

Compliance will be demonstrated through acoustic reporting at Building License, with verification of some performance elements on site at practical completion.

2.5 Performance Verification

Building envelope testing is to be completed close to practical completion to verify low leakage rates. This can reduce condensation risk as well as improve occupant comfort and reduce energy consumption.

2.6 Low Toxicity Materials

Carpets, paints and wood products will target best practice for VOC and formaldehyde content, targeting improved health outcomes for occupants.

3. Minimised Footprint

The Greenhouse Effect and global warming has been identified as the most significant environmental challenge of our times. Increasingly corporations and governments are embracing the need to act through setting performance goals and penalising carbon inefficiency with increasing utility costs.

The team are aware of the need for projects to act responsibly with their ecological footprint both initially and in operation. Best practise design can successfully reduce energy and water consumption, divert waste from landfill and minimise refrigerant carbon footprint. Site selection can minimise impact on existing fauna and offer the potential for developments to act as a restorative force.

Many of the features in other categories contribute to improved building carbon efficiency, including natural ventilation, an efficient envelope and water efficiency measures. Sustainable transport options also reduce the carbon footprint of building occupants and visitors.

The following additional design features are intended to delivery embodied and operational carbon footprint improvements:

3.1 Considered Development

The building will be within a well-established community, on a brown field site, limiting impacts to local ecology and providing the potential to improve biodiversity with native planting.

3.2 Renewable Energy

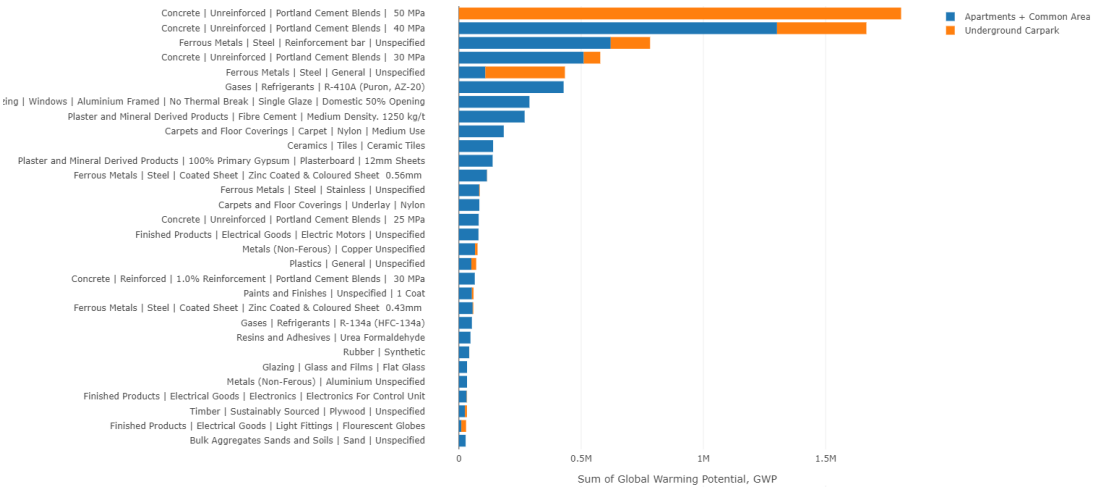
The design intent is to include potential for roof mounted solar panels building, targeting around 1.5kW per dwelling. Exact sizing and generation profile is to be confirmed as building form and number of apartments are confirmed, however design is progressing on a 36kWP array, with potential for a future 24.86kWhr battery. The system is expected to produce more than 40MWh of electricity annually and should offset more than 50% of the annual electrical demand of the building.

The future battery system can improve utilisation of solar on site and provide a measure of grid resilience in the event of instability.



3.3 Embodied Energy

The proposed design will be targeting a reduction in upfront carbon through material selections, and design rationalisation. The image below shows the typical breakdown and embodied of different construction materials for apartment buildings over a project lifetime.



Assessment of similar style developments shows that concrete and steel make up the majority of the building's upfront carbon emissions. The design team will be reviewing the potential for the use of a post-tensioned slab, replacement of Portland cement and selection of sustainably sourced steel to assist in minimising this footprint. In addition, window frames will consider the use of LocAl Capral frames – achieving a reduction of around 50% in embodied carbon emissions in window frames.

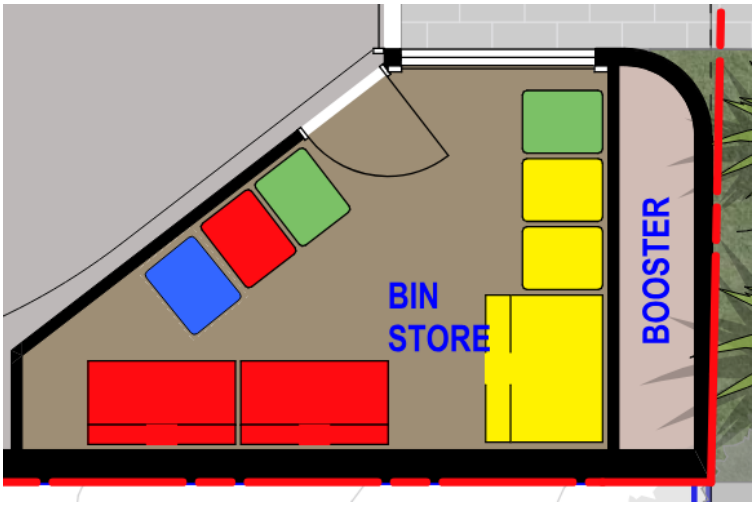
In addition to aluminium, concrete and steel, refrigerants can also play a major role in building embodied and upfront carbon. The mechanical design will seek to utilise R32 refrigerant in lieu of the more common blends, with systems aiming to be kept small and local to limit capacity and refrigerant in pipework – a reduction of around 60% in refrigerant carbon footprint.

The project team will review finalised design against similar building types and provide comment at completion.

3.4 Waste Management

The design includes provision for separation of four waste streams; recycling, waste, organics and paper for the office tenancy.

Apartment design will include at least three separate collection points to improve separation convenience for users.



3.5 Appliance Efficiency

The designers will be targeting efficient appliances and tapware, as follows:

Appliances:

Item	Reference	Reference Performance	Reference Annual Energy	Target Performance
Fridge / Freezer	Fresh Food – 250 L Freezer – 100L	2.5 Stars	436 kWhrs	3.5 Slars
Dish Washer	12 Setting	3 Stars	282 kWhrs	4 Stars
Clothes Washer	7kg	3.5 Stars	367 kWhrs	4.5 Stars
Clothes Dryer	6kg	4.5 Stars	200 kWhrs	5.5 Stars

Water Efficiency

Low flow tapware, sanitary fixtures and appliances (where provided):

Fixture Type	Minimum WELS rating	Target Flow Raes
Taps	5 stars	4.5 L/min
Toilets	4 stars	<3.5 L average flush <4.7L full flush, <3.2 half flush
Showers	3 stars	6.0 L/min
Clothes Washing Machines	4 stars	
Dishwashers	5 stars	

3.6 Overall Performance

Overall, the project team are seeking to demonstrate at least a 30% performance improvement in operational energy and 10% water reduction against typical performance. Design features above will contribute to this target:

- Improved building envelope: One star margin on Section J Compliance
- Efficient Services 10% Margin on Section J Compliance
- Low water use WELS rated fittings and appliances.
- Controls Automated lighting and car park ventilation

4. Future Resilience

FCDS has undertaken a base review of the project and the potential likely impacts of climate change on the site, based on the following likely impacts of climate change in Southwest WA:

Variable	Current	Predicted	Expected Change	Possible Range
Annual Average Temperature (°C)	25.8°C	29.3°C	+3.5°C	28.4 – 30°C
Number of days over 35°C	28	63	+35	50-72
Annual Average Rainfall (mm)	851.7mm	698mm	-18%	536 – 809mm
Summer	40.5mm	38.5mm	-5%	27.9 – 55.1mm
Autumn	144.1mm	135.4mm	-6%	98 – 162.8mm
Winter	398.2mm	282.7mm	-29%	223 – 338.5mm
Spring	147.5mm	94.4mm	-36%	60.5 – 126.8mm
Annual Average Potential Evaporation	1800mm	1836mm	+2%	1818-1872mm
Annual Relative Humidity	55%	54.4%	-0.6%	53.7 – 55%

4.1 Risk Review

The development site is not considered to be at significant risk of climate impacts, as confirmed through the GBCA climate change risk assessment checklist:

Checklist	Criteria Response	Future Climate Exposure Reviewed?	Risk to the project identified?	Risk treatment identified?	Design / Operational Measure
Has the project area been previously impacted by extreme climate events?	No	Yes	No	No	NA
Is the project located in a cyclone zone?	No	Yes	No	No	NA
Is the project located in or adjacent to a bushfire prone area?	No	Yes	No	No	NA
Is the project located in or adjacent to a flood prone area?	Yes	Yes	Yes	Yes	Avoid key infrastructure below ground level.
Is the project located at or adjacent to the coastline or tidally influenced waterway?	Yes	Yes	Yes	Yes	Avoid key infrastructure below ground level.
Will the project accommodate occupants vulnerable to the impacts of climate extremes?	No	Yes	No	No	Improved envelope. Efficient Air Conditioning Onsite generation.

4.1.1 Flood Risk – Very High Inundation Scenario

Coastal risk maps indicate that the site is likely to experience flooding under 2100 climate change scenarios. Key plant should be retained above ground level.



Above: Coastal Risk Australia

4.1.2 Bushfire Prone Areas

Bushfire zone maps show that the site well away from areas considered bushfire prone.

4.2 Design Response

Notwithstanding the low-risk rating, the design team have included the following features to mitigate risks and provide an improved outcome for occupants and the local community:

Climate Change Impact	Risk	Proposed Response
Increased temperatures lead to increased bushfire risk and intensity.	Low.	Multiple orientations for natural ventilation. .
Rising sea levels and increased flood risk.	High	Ensure structure can adapt to changing water levels. Avoid major plant at low levels
Reduced rainfall	Increasing requirement for irrigation, increased cost of scheme water.	Utilise smart irrigation, including moisture detection and prioritise drought tolerant planting. Utilise native planting where possible.
Increased temperatures lead to increased reliance on air conditioning.	Building is unable to provide comfortable environment for extended periods.	Provide high efficiency air conditioning systems with automatic controls. Upgrade building envelope in excess of BCA minimum requirements. Reduce urban heat island effect.
Increased temperatures lead to increased power demand.	Operating cost increases as electrical prices increase. Power security becomes questionable.	Good control systems and energy efficient design. Potential for solar photovoltaics for renewable generation.

4.2.1 Water Efficient Fittings

Where provided, fittings and appliances will target high water efficiency, generally within 1 Star of the best available WELS rating for each fitting type, as per the footprint section.

Low flow fittings save water, operational costs, carbon emissions and energy use when they utilise hot water.

4.2.2 Native or Drought Tolerant Planting

The design team will be including water efficient planting and irrigations to target a 30% reduction in water use against Green Star benchmarks and to minimise operational costs and carbon emissions.

Building license documentation will include these elements.

4.2.3 Urban Heat Island Mitigation

The project team intend to meet Green Star best practice guidelines for urban heat island by maintaining 75% of the site as either vegetation, shaded areas or elements with a 3-year SRI of 64 or greater.

Building license plans and finish selections will demonstrate this performance outcome.

4.3 Fossil Fuel Elimination

The project will progress as a fossil fuel free design as far as practical. The location is understood to have limitations with available electrical infrastructure and, as such, may require gas for some elements.

The above notwithstanding, electrical design will include sufficient on site capacity for all cooking, heating and domestic hot water generation, ready for transition when infrastructure is available and / or when elements are replaced.

The design team notes that the use of gas for some elements is considered to be environmentally beneficial for cooking in the short to medium term, as follows:

Gas Cooking Sustainability Review:
Cooking makes up ~5% of the average Australian Household energy consumption (https://www.redenergy.com.au/living-energy/energy-saving/how-to-save-energy-in-your-apartment) – relatively minor in comparison to water heating (~29%) and air conditioning (~27% https://www.energy.nsw.gov.au/households/tips/save).

Gas cooking remains carbon efficient in comparison to electric stove top cooking at current grid carbon densities:

	Gas	Electricity
Efficiency	50%	70%
1kW Cooking	2kWhr Gas	1.4kWhr Electricity
Carbon Density	0.23 kg/kWHr	0.56 kg/kWHr
Carbon Emissions	0.46 kg $CO_{2(e)}$	0.78 kg $CO_{2(e)}$

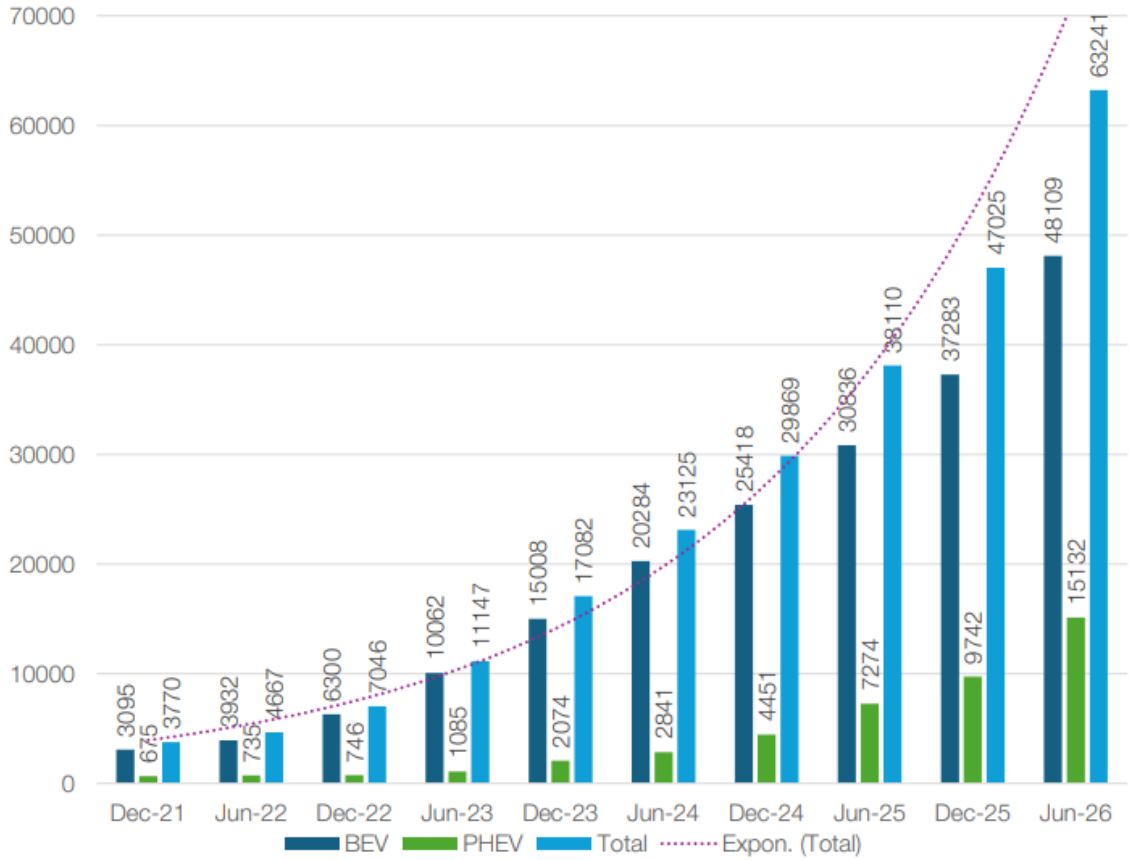
Gas will remain a carbon efficient cooking solution until the grid reduces emissions by around 40%. Considering the expected life of the kitchens cooktop is around 7-10 years, it is likely that gas cooking initially, with transition to electric cook tops in future would be the optimal carbon solution.

5. Sustainable Transport

Increasingly, Perth drivers are transitioning away from tradition Internal Combustion Engine vehicles – with the current rate of 6.6% of new vehicles (2023) set to be ~10% by 2025 and more than 50% in 2030 (https://www.watoday.com.au/politics/western-australia/future-planning-is-this-the-year-petrol-will-disappear-from-wa-20231218-p5esbe.html).

The graph below shows the uptake in electric vehicles since the end of 2021 (Western Australian Electric Vehicle Analysis Summary 2026 Q2 – Department of Transport):

Figure 1a: Graph - Cumulative electric vehicle data December 2021 to June 2026



Recognising this shift, design will be seeking to facilitate alternate transport options, as described in the following sections.

5.1 Electric Vehicle Facilitation

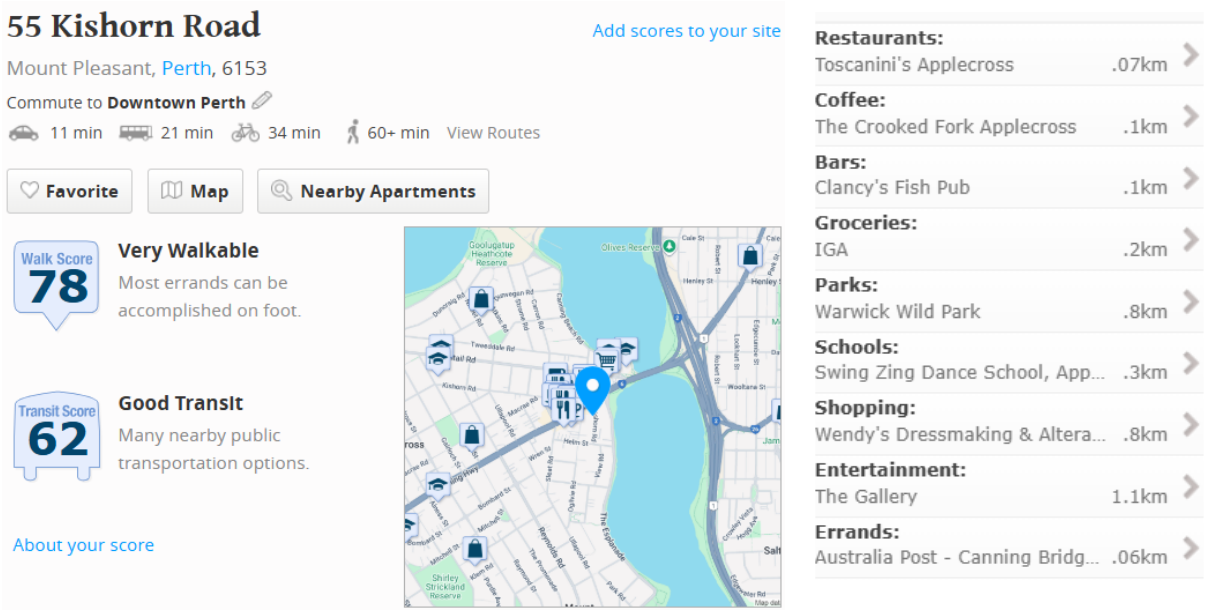
The design will include a dedicated EV distribution board for the carpark, sized to cater for ~5 EV chargers. The design will include key infrastructure provisions, including:

- Load management systems to deliver at least 12kWh per bay between 11PM and 7AM daily.
- Space to allow for electricity metering, as part of the embedded network provision
- Cable containment consideration to provide chargers to all bays.
- Potential for use of 7kW / 32A type two chargers.
- Chargers for 3 bays at opening

Electrical design documentation will show these provisions at building license stage.

5.2 Street Activation

The design is intended to link with the existing local pedestrian ways and amenities:





This connection improves a range of outcomes, including carbon footprint, resilience and occupant health and wellbeing, as well as contributing to the local community.

6. Response to DRP Comments

At the initial DRP meeting the development received the following ESD Commentary:

- Strengths
  - Most apartments appear to be capable of being cross ventilated in the context for the R-Code metrics.
  - Some bike parking has been identified
  - Some PV has been shown notionally
- Areas for Improvement
  - Develop a sustainability strategy that identifies quantifiable commitments and targets. preferably focussing on committing to key initiatives well, rather than making multiple token efforts across a broader range of initiatives
  - Utilising an ESD consultant is appropriate for this scale of project
  - Clarify the intended capacity for PV aim for 3kW per apartment, with an absolute minimum of 1.5kW per apartment
  - Look to using LCC and other materials with recycled content
  - Avoid gas appliances
  - Review heat loads on exposed major openings and shade appropriately

The following sections address these comments:

6.1 Engage an ESD Consultant and Develop a Sustainability Strategy

The project team have engaged FCDS to assist with the development and implementation of a sustainability strategy for the site.

As per the recommendations above, the project team are focused on delivering four key sustainable themes as design outcomes for the project, as follows:

- Healthy living
  - The design should promote occupant health and wellbeing, both through internal design and access to external spaces.

- Minimised footprint and operational costs
  - The design must ensure that operational utility use – such as energy and water – are minimised, with long life cycle products and low carbon technology where possible.
  - The development should minimise impacts to nature and local ecology.

- Climate resilience and future focus
  - The development has a design life of in excess of 50 years. The project just provide high performance in current climatic conditions, with flexibility and resilience to suit weather patterns in 2080 and beyond.

- Sustainable transport
  - The location of the project will assist occupants in reducing their dependence on cars. Integration and facilitation of sustainable transport options is key for project success.

These themes are to be delivered though design features which align with international benchmarks and recognised national best practice.

6.2 Clarify the Extent of PV

The project is targeting a 36kW array – nominally 66 550W panels. This aligns with the recommendation to achieve 1.5kW of panels per apartment noting:

- This size array takes up effectively 100% of the available roof area. There is no additional room for extra panels.
- 1.5kW per apartment will provide ~2.5MWhrs per apartment per annum. This is likely to be more than 50% of the total annual demand and will result in significant energy export during summer months. Increasing the array size is likely to be economically inefficient.

6.3 Look to Use Low Carbon Concrete and other Materials with Recycled Content

The design team will be seeking to complete a life cycle goal setting analysis for the project, with an intent to address major carbon hotspots – including concrete and steel. Upfront carbon will be reduced, where possible by:

- Use of concrete mixes with reduced cement content
- Use of timber for internal studs and / or finishes
- Limitation of aluminium in building envelope
- EPD Certified steel
- Efficient structural design, including flat slabs and/or PT style construction
- >50% Recycled content in insulation
- Limited refrigerant pipe lengths to minimise refrigerant content
- Selection of R32 refrigerant where possible

6.4 Avoid Gas Appliances

The project will progress as a fossil fuel free design as far as practical. The location is understood to have limitations with available electrical infrastructure and, as such, may require gas for some elements.

The above notwithstanding, electrical design will include sufficient on site capacity for all cooking, heating and domestic hot water generation, ready for transition when infrastructure is available and / or when elements are replaced.

6.5 Review Heat Loads

The project design includes relatively limited glazing to the west and north, with solid walls and building core acting to limit summer sun.

The project will be targeting at least a 7.5 Star NatHERS rating for all apartments – requiring appropriate location, sizing and shading of windows as well as good quality glass selection.

7. Feature Summary

Many of the features proposed above offer performance improvements across a range of themes. The following table outlines the proposed features and the demonstration pathway – aligning with national best practice benchmarks – selected for the project team.

Design Feature	Benchmark Performance	Verification Method	Healthy Living	Building Footprint	Climate Resilience	Sustainable Transport
Alternate Transport	Bike parks shown for apartments and visitors	Design documents	X	X		X
EV Facilitation	EV Charging potential to 100% of bays, at least 4 chargers installed initially	Design documents		X		X
Efficient Envelope	7.5 Star NatHERS average for apartments	Building License Report	X	X	X	
Envelope Testing	Leakage test on three dwellings at completion	Report	X	X	X	
Native Planting	Demonstrate 30% reduction in water use against typical practice	Report at Building License		X	X	
Fossil Fuel Free Site	Cater for transition away from fossil fuels when electrical infrastructure is available.	Design documents		X	X	
Renewable Energy	36kW Solar PV Panels	Performance Specification		X	X	
Onsite Energy Storage	Allowance for future ~24kWhs Battery storage for grid resilience and improved solar utilisation	Performance Specification		X	X	
Urban Heat Island	Achieve 75% of site with a 3-year SRI of 64 or greater	Design documents	X	X	X	
Waste Plan	Waste store to allow for three streams. Joinery in dwellings to segregate three streams	Design documents		X		
Embodied Energy	Target reduction in life cycle footprint, by targeting LCA hot spot materials	Material review at Building License		X	X	
Water Efficiency	WELS rated fittings – Within 1 Star of best available, provide efficient washers and dryers	Design documents		X	X	
Energy Efficiency	Efficient major appliances – target 1 star above average practice	FF&E Schedule		X	X	
Street Activation	Connect to local pedestrian infrastructure, provide suitable street furniture	Landscape Plans	X			X
E-Bike Facilitation	Provision of power and ventilation to bike parking areas for e-ridable facilitation		X			X
Low Toxicity Materials	Utilise low VOC and formaldehyde internal finishes, adhesives and sealants. Air quality test at completion	Material review at Building License	X			
Natural Ventilation	Comply with AS 1668.4 for natural ventilation to all apartments	Report at Building License	X	X	X	
Operational Footprint	30% reduction in operational energy through envelope and services.	Report at Building License		X	X	
Occupant Engagement	Potential for live display in communal / ground floor area with information on energy, water, weather and local transport information		X		X	X



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