LEED Energy Efficiency Report

Aurecon

Appendix R

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Western Sydney Stadium

LEED Summary

Lendlease

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Bringing ideas to life

Document control record

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Appendix A

LEED Pathway

1 Executive Summary

This LEED summary report has been produced to demonstrate the design initiatives that are to be included in the proposed Western Sydney Stadium (WSS).

The WSS is targeting a LEED New Construction Gold V4 rating and will reduce energy and water consumption through efficient air conditioning and lighting design, water efficient fittings and rainwater reuse. The overall planning and design of the building also maximises indoor environment quality outcomes through high levels of daylight, air movement and the use of environmentally friendly materials.

The proposed LEED Gold pathway for the WSS including which credits are being targeted is shown in Appendix A. Whilst the Gold rating target is a project target, the pathway to reach this objective will be revised as the design progresses.

2 LEED – New Construction

2.1 Background

LEED is a comprehensive and international environmental rating scheme administered by the US Green Building Council (USGBC) and evaluates the environmental design achievements of buildings of various typologies, including stadiums. Ratings range from Bronze to Silver, Gold and Platinum based on the achievement of credits in the following categories:

- Integrative Process
- Location and Transport
- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environment Quality
- Innovation

There are numerous LEED rated stadiums globally providing an established rating tool for benchmarking. Aspirations for the Western Sydney Stadium are for a Gold New Construction V4 rating.

Overall, the stadium is to set a leading example of a sporting facility of world class tier-2 standard, both in design and operation targeting a Gold rating.

The following sections outline the sustainability benefits of the LEED credits that are to be included in the project.

CERTIFICATION
40 - 49 POINTS

SILVER
50 - 59 POINTS

GOLD
60 - 79 POINTS

PLATINIUM
80 - 110 POINTS

2.2 Integrative Process

The Integrative Process category rewards the integrated, cost-effective adoption of green design and construction strategies, emphasizing human health as a fundamental evaluative criterion for building design, construction and operational strategies.

Design Initiative	Intent
Integrative Process	To support high-performance, cost-effective project outcomes through an early analysis of the interrelationships among systems.

2.3 Location and Transport

The Location and Transportation (LT) category rewards thoughtful decisions about building location, with credits that encourage compact development, alternative transportation, and connection with amenities, such as restaurants and parks.

Design Initiative	Intent
Sensitive Land Protection	To avoid the development of environmentally sensitive lands and reduce the environmental impact from the location of a building on a site.
High Priority Site	To avoid the development of environmentally sensitive lands and reduce the environmental impact from the location of a building on a site.
Surrounding Density and Diverse Uses	To conserve land and protect farmland and wildlife habitat by encouraging development in areas with existing infrastructure. To promote walkability, and transportation efficiency and reduce vehicle distance travelled. To improve public health by encouraging daily physical activity.
Access to Quality Transit	To encourage development in locations shown to have multimodal transportation choices or otherwise reduced motor vehicle use, thereby reducing greenhouse gas emissions, air pollution, and other environmental and public health harms associated with motor vehicle use.
Bicycle Facilities	To promote bicycling and transportation efficiency and reduce vehicle distance travelled. To improve public health by encouraging utilitarian and recreational physical activity.
Reduced Parking Footprint	To minimize the environmental harms associated with parking facilities, including automobile dependence, land consumption, and rainwater runoff.

2.4 Sustainable Sites

The Sustainable Sites (SS) category rewards decisions about the environment surrounding the building, with credits that emphasize the vital relationships among buildings, ecosystems, and ecosystem services. It focuses on restoring project site elements, integrating the site with local and regional ecosystems, and preserving the biodiversity that natural systems rely on.

Design Initiative	Intent
Site Assessment	To assess site conditions before design to evaluate sustainable options and inform related decisions about site design.
Site Development – Protect or Restore Habitat	To conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.
Open Space	To create exterior open space that encourages interaction with the environment, social interaction, passive recreation, and physical activities.
Rainwater Management	To reduce runoff volume and improve water quality by replicating the natural hydrology and water balance of the site, based on historical conditions and undeveloped ecosystems in the region.
Heat Island Reduction	To minimize effects on microclimates and human and wildlife habitats by reducing heat islands.
Light Pollution Reduction	To increase night sky access, improve night time visibility, and reduce the consequences of development for wildlife and people.

2.5 Water Efficiency

The Water Efficiency (WE) section addresses water holistically, looking at indoor use, outdoor use, specialized uses, and metering. The section is based on an “efficiency first” approach to water conservation.

Design Initiative	Intent
Outdoor Water Use Reduction	To reduce outdoor water consumption.
Indoor Water Use Reduction	To reduce indoor water consumption.
Cooling Tower Water Use	To conserve water used for cooling tower makeup while controlling microbes, corrosion, and scale in the condenser water system.
Water Metering	To support water management and identify opportunities for additional water savings by tracking water consumption.

2.6 Energy and Atmosphere

The Energy and Atmosphere (EA) category approaches energy from a holistic perspective, addressing energy use reduction, energy-efficient design strategies, and renewable energy sources.

Design Initiative	Intent
Optimise Energy Performance	To achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic harms associated with excessive energy use.
Enhanced Commissioning	To further support the design, construction, and eventual operation of a project that meets the owner's project requirements for energy, water, indoor environmental quality, and durability.
Advanced Energy Metering	To support energy management and identify opportunities for additional energy savings by tracking building-level and system-level energy use.
Renewable Energy Production	To reduce the environmental and economic harms associated with fossil fuel energy by increasing self-supply of renewable energy.
Enhanced Refrigerant Management	To reduce ozone depletion and support early compliance with the Montreal Protocol while minimizing direct contributions to climate change.
Green Power and Carbon Offsets	To encourage the reduction of greenhouse gas emissions through the use of grid-source, renewable energy technologies and carbon mitigation projects.

2.7 Materials and Resources

The Materials and Resources (MR) credit category focuses on minimizing the embodied energy and other impacts associated with the extraction, processing, transport, maintenance, and disposal of building materials. The requirements are designed to support a life-cycle approach that improves performance and promotes resource efficiency. Each requirement identifies a specific action that fits into the larger context of a life-cycle approach to embodied impact reduction.

Design Initiative	Intent
Building Life-Cycle Impact Reduction	To encourage adaptive reuse and optimize the environmental performance of products and materials.
Building Product Disclosure and Optimisation	To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts.
Construction and Demolition Waste Management	To reduce construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing, and recycling materials.

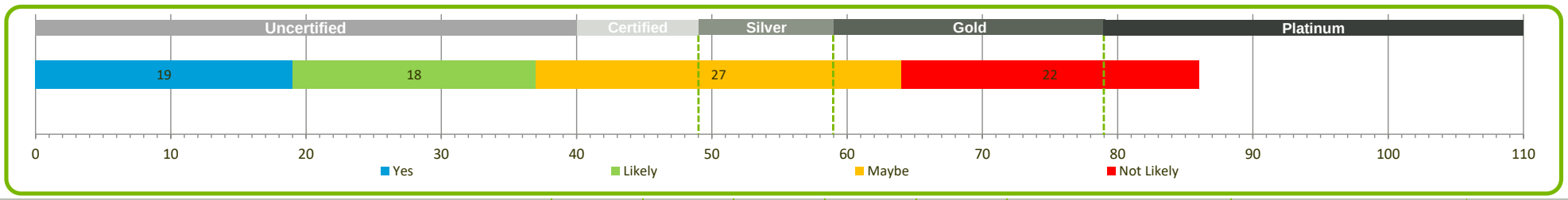
2.8 Indoor Environment Quality

The Indoor Environmental Quality (EQ) category rewards decisions made by project teams about indoor air quality and thermal, visual, and acoustic comfort. Green buildings with good indoor environmental quality protect the health and comfort of building occupants.

Design Initiative	Intent
Enhanced Indoor Air Quality Strategies	To promote occupants' comfort, well-being, and productivity by improving indoor air quality.
Low-Emitting Materials	To reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.
Construction Indoor Air Quality Management Plan	To promote the well-being of construction workers and building occupants by minimizing indoor air quality problems associated with construction and renovation.
Indoor Air Quality Assessment	To establish better quality indoor air in the building after construction and during occupancy.
Thermal Comfort	To promote occupants' productivity, comfort, and well-being by providing quality thermal comfort.
Interior Lighting	To promote occupants' productivity, comfort, and well-being by providing high-quality lighting.
Daylight	To connect building occupants with the outdoors, reinforce circadian rhythms, and reduce the use of electrical lighting by introducing daylight into the space.
Quality Views	To give building occupants a connection to the natural outdoor environment by providing quality views.
Acoustic Performance	To provide workspaces that promote occupants' wellbeing, productivity, and communications through effective acoustic design.

Appendix A
LEED Pathway

PROJECT TITLE:	**Western Sydney Stadium**
DOCUMENT:	**LEED V4 Credit Summary**
AUTHOR:	Quentin Jackson
DATE:	17/02/2017



Category	Credit	Possible	Yes	Likely	Maybe	Not Likely	Actions	Comments	Responsibility
Integrative Process	IP102: Integrative Process	1	1	0	0	0	Document modelling process.	Energy and Water analysis from schematic design.	Aurecon (ESD)
	Integrative Process Credits Totals	**1**	**1**	**0**	**0**	**0**			
Location and Transportation	LT101: LEED For Neighbourhood Development Location	16	0	0	0	0	-	Not targeted as project is not located in a LEED For Neighbourhood Development Location	-
	LT102: Sensitive Land Protection	1	1	0	0	0	Provide plans of previously development on site.	Project on previously developed land	Lendlease (Grant Helson)
	LT103: High Priority Site	2	0	0	2	0	Provide reports of contamination, hazardous materials etc	High value site (remediation etc)	Lendlease (Grant Helson)
	LT104: Surrounding Density and Diverse Uses	5	1	0	1	1	Provide markup of surrounding area as per LEED Requirements	TBC - calculation of surrounding area for diverse services.	Populous (Danna Priyatna)
	LT107: Access To Quality Transit	5	1	0	1	1	Provide markup of surrounding transit options	Calculation required	Populous (Danna Priyatna)
	LT108: Bicycle Facilities	1	1	0	0	0	Confirm current provision of facilities, location, number etc. Jo-Ann to forward CIR from previous project	Bike racks & EOTF (2.5% of peak, 5% of reg - need to confirm how visitor numbers can be adjusted). Confirm numbers are based on permanent staff.	Populous (Danna Priyatna)
	LT110: Reduced Parking Footprint	1	0	0	0	1	Confirm council minimum parking requirements and compare with what is provided.	Don't exceed local council min. Find out what council requirements are and go from there.	Populous (Danna Priyatna)
	LT111: Green Vehicles	1	0	0	0	0	-	Not targeted due to onerous cost.	-
	Location and Transportation Totals	**32**	**4**	**0**	**4**	**3**			
Sustainable Sites	SS101: Construction Activity Pollution Prevention	Prerequisite					Provide copies of plans.	Erosion and Sediment control plan	Lendlease (Grant Helson)
	SS104: Site Assessment	1	0	1	0	0	Provide copies of EIS and any other site surveys,	Site survey including climate, vegetation, topography, soils etc before design. EIS? JVA have undertaken reports.	Lendlease (Grant Helson)
	SS105: Site Development - Protect or Restore Habitat	2	0	0	0	2	Review proportions before and after to see if achievable.	Restore 30% of previously development with native or adapted vegetation or pay money.	Aspect
	SS107: Open Space	1	0	0	1	0	Review proportions to see if achievable.	30% to be outdoor, minimum of 25% must be vegetated (turf doesn't count) - what does this mean.	Aspect
	SS108: Rainwater Management	3	0	0	0	3	Check 95th percentile event and if any change to design required to comply with credit.	Manage at least 95th percentile rain event. Rainwater tank (50kL),	Aurecon - Civil
	SS110: Heat Island Reduction	2	0	0	2	0	Markup site plan with percentage area for each material and confirm product selection.	Provide shading and material selection for roof material (high reflectance)	Populous (Danna Priyatna)
	SS112: Light Pollution Reduction	1	0	1	0	0	Confirm which pathway to be taken and if current design can comply.	Light at boundary and upward light.	Stowe (Sean Dawson)
	Sustainable Sites Totals	**10**	**0**	**2**	**3**	**5**			
Water Efficiency	WE101: Outdoor Water Use Reduction	Prerequisite					Confirm irrigation system intended design.	Exclude field. Remaining landscape xeriscaping or reduced water use compared to benchmark.	Aspect
	WE901: Outdoor Water Use Reduction	2	2	0	0	0	Confirm irrigation system intended design.		Populous (Danna Priyatna)
	WE102: Indoor Water Use Reduction	Prerequisite					Confirm fixture and fitting selection.	Reduction in water use - fixtures, fittings etc	Populous (Danna Priyatna)
	WE902: Indoor Water Use Reduction	6	1	2	0	1	Confirm fixture and fitting selection.	Further use from pre-requisite, rainwater etc	Populous (Danna Priyatna)
	WE104: Building-Level Water Metering	Prerequisite					Confirm metering strategy. Grant Helson to raise commitment to sharing with Infrastructure NSW	Install metering and commit to sharing data.	Johnson Controls (Samit Sen)
	WE110: Cooling Tower Water Use	2	0	0	0	2	Register for pilot credit - no cooling towers http://www.usgbc.org/node/5586086?return=/pilotcredits/New-Construction/all	Air cooled chillers - confirm if points can be claimed.	Aurecon (ESD)
	WE112: Water Metering	1	1	0	0	0	Confirm metering strategy. Grant Helson to raise commitment to sharing with Infrastructure NSW	Subsystem water metering (min 2 - DHW, irrigation etc)	Johnson Controls (Samit Sen)
	Water Efficiency Totals	**11**	**4**	**2**	**0**	**3**			
nd Atmosphere	EA101: Fundamental Commissioning and Verification	Prerequisite					Confirm project can be commissioned in accordance with ASHRAE requirements.	ASHRAE commissioning process	AG Coombs (Paul Archer) & Stowe (Sean Dawson)
	EA103: Minimum Energy Performance	Prerequisite						5% improvement on Section J or ASHRAE 90.1	AG Coombs (Paul Archer) & Stowe (Sean Dawson) & Aurecon (ESD)
	EA903: Optimize Energy Performance	18	0	8	4	0		30% improvement in energy performance	AG Coombs (Paul Archer) & Stowe (Sean Dawson) & Aurecon (ESD)
	EA106: Building-Level Energy Metering	Prerequisite					Confirm metering strategy. Grant Helson to raise commitment to sharing with Infrastructure NSW	Install metering and commit to sharing data.	Johnson Controls (Samit Sen)
	EA108: Fundamental Refrigerant Management	Prerequisite					Confirm refrigerant types being used on project.	No CFC based refrigerant	AG Coombs (Paul Archer)
	EA110: Enhanced Commissioning	6	4	0	0	2	Confirm appointment of ICA and intent to target airtightness testing	ICA - undertakes detailed commissioning process or envelope?	Lendlease (Grant Helson)

Category	Credit	Possible	Yes	Likely	Maybe	Not Likely	Actions	Comments	Responsibility
Energy a	EA118: Advanced Energy Metering	1	1	0	0	0	Confirm metering strategy.	Detailed metering	Johnson Controls (Samit Sen)
	EA121: Demand Response	2	0	0	0	2	Confirm achievability.	Load shed or shift	Stowe (Sean Dawson)
	EA123: Renewable Energy Production	3	0	1	0	0	Confirm ability to increase current allowance	1 = 1%, 2 = 5%, 3 = 10%	Stowe (Sean Dawson)
	EA126: Enhanced Refrigerant Management	1	0	0	1	0		Low ODP AND GWP	AG Coombs (Paul Archer)
	EA128: Green Power and Carbon Offsets	2	0	0	0	1	Provide calculation from previous project for comparative purposes.	50% or 100% for 5 years.	Lendlease (Jo-Ann Gamble)
	Energy and Atmosphere Totals	**33**	**5**	**9**	**5**	**5**			
Materials and Resources	MR101: Storage and Collection of Recyclables	Prerequisite					Confirm current provision meets requirements.	Storage of Recyclables	Populous (Danna Priyatna)
	MR103: Construction and Demolition Waste Management Planning	Prerequisite					Provide plans and / or intent to complete plans	Construction & Waste Management Plans	Lendlease (Grant Helson)
	MR108: Building Life-Cycle Impact Reduction	5	0	1	0	4		Brief has a 30% reduction in our carbon.	LCA
	MR112: Building Product Disclosure and Optimization - Environmental Product Declarations	2	0	0	1	1	Check with LEED as to approved products currently. Jo-Ann - confirm products / suppliers that LL has agreements with.	EPDs 20 products from 5 manufacturers	Lendlease (Jo-Ann Gamble) & Aurecon (ESD)
	MR114: Building Product Disclosure and Optimization - Sourcing of Raw Materials	2	0	0	1	0	Check with LEED as to approved products currently. Jo-Ann - confirm products / suppliers that LL has agreements with.	Use manufacturers that disclose the source of their raw ingredients. 20 products, 5 manufacturers	Lendlease (Jo-Ann Gamble) & Aurecon (ESD)
	MR115: Building Product Disclosure and Optimization - Material Ingredients	2	0	0	1	0	Check with LEED as to approved products currently. Jo-Ann - confirm products / suppliers that LL has agreements with.	Use manufacturers that disclose chemical ingredients. 20 products, 5 manufacturers	Lendlease (Jo-Ann Gamble) & Aurecon (ESD)
	MR123: Construction and Demolition Waste Management	2	2	0	0	0	Confirm intent to divert at least 80%.	Diversion of 75% of waste from four waste streams from landfill.	Lendlease (Grant Helson)
	Materials and Resources Totals	**13**	**2**	**1**	**3**	**5**			
Indoor Environmental Quality	EQ101: Minimum Indoor Air Quality Performance	Prerequisite					Confirm compliance wit ASHRAE 62.1	Comply with ASHRASE 62.1 2010	AG Coombs (Paul Archer)
	EQ104: Environmental Tobacco Smoke Control	Prerequisite					Confirm compliance.	Prohibit smoking inside.	Populous (Danna Priyatna)
	EQ110: Enhanced Indoor Air Quality Strategies	2	0	1	1	0	Confirm how many points can be achieved.	Entryway protection, exhaust and filtration additional point increased ventilation rates, CO2 monitoring etc	AG Coombs (Paul Archer)
	EQ112: Low-Emitting Materials	3	0	2	1	0	Confirm expected unique product selections.	VOCs, flooring, wood etc or budget calculation	Populous (Danna Priyatna)
	EQ113: Construction Indoor Air Quality Management Plan	1	1	0	0	0	Confirm CIAQ will be in place.	CIAQ during construction	Lendlease (Grant Helson)
	EQ114: Indoor Air Quality Assessment	2	0	0	1	0	Confirm points achievable.	Building Flush out (1 pt), IAQ Testing (2 pts)	Lendlease (Grant Helson)
	EQ115: Thermal Comfort	1	0	0	0	1	Confirm if comfort control provided.	PMV between -0.5 and +0.5 & Thermal Comfort control over environment to 50% of occupants	AG Coombs (Paul Archer)
	EQ117: Interior Lighting	2	1	0	1	0	Confirm points achievable.	Lighting controls, lighting design and light fitting selections	Stowe (Sean Dawson)
	EQ121: Daylight	3	0	0	2	0		Spatial Daylight Autonomy (% area over 300 lux for 50% of time) and Annual Sunlight Exposure (1000 lux for more than 250 hours for max 10% of year)	Aurecon (ESD)
	EQ123: Quality Views	1	0	0	1	0	Confirm views achievable.	Direct line of sight to outdoors for 75% of occupants	Populous (Danna Priyatna)
	EQ124: Acoustic Performance	1	0	1	0	0	Grant to get Acoustic Logic to review.	HVAC, STC, RT, exterior noise, sound materials	Acoustic Logic
	Indoor Environmental Quality Totals	**16**	**2**	**4**	**7**	**1**			
Innovation	IN101: Innovation	5	0	0	2	0		Waste at least 80%, publically available case study. Site sheds.	All
	IN102: LEED Accredited Professional	1	1	0	0	0	Confirm PSA is approved.	Lendlease and Aurecon can achieve this credit.	Aurecon (ESD)
	Innovation Totals	**6**	**1**	**0**	**2**	**0**			
Regional Priority	RP Credit 1.1: Regional Priority - Renewable Energy Production	4	0	0	0	0		TBC once credits above are confirmed.	Stowe (Sean Dawson)
	RP Credit 1.2: Regional Priority - Green Power and Carbon Offset		0	0	0	0		TBC once credits above are confirmed.	Lendlease (Jo-Ann Gamble)
	RP Credit 1.3: Regional Priority - Bldg Product disclosure, Material Ingredients		0	0	0	0		TBC once credits above are confirmed.	Lendlease (Jo-Ann Gamble) & Aurecon (ESD)
	RP Credit 1.4: Regional Priority - Open space		0	0	1	0		TBC once credits above are confirmed.	Aspect
	RP Credit 1.5: Regional Priority - Outdoor water use reduction		0	0	1	0		TBC once credits above are confirmed.	Populous (Danna Priyatna)
	RP Credit 1.6: Regional Priority - Indoor water use reduction		0	0	1	0		TBC once credits above are confirmed.	Aurecon (ESD)
	Regional Priority Totals (Up to a maximum of 4 credits)	**4**	**0**	**0**	**3**	**0**			
Overall Totals		**126**	**19**	**18**	**27**	**22**			

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