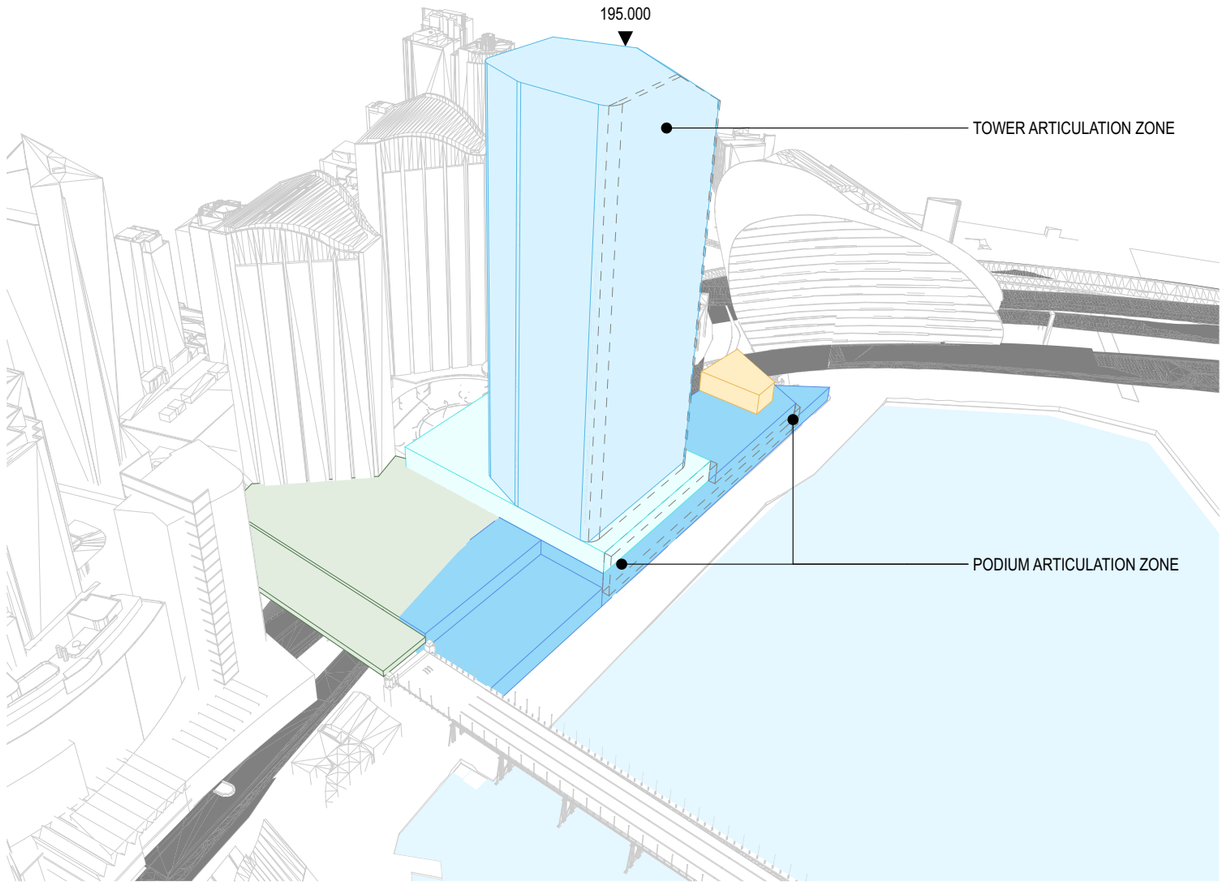
STAGE 1 SSDA AMENDED CONCEPT PROPOSAL **SK-4.21**

LEGEND:

- TOWER
- PODIUM
- SOUTHERN PAVILION
- TOWER BASE
- DECK



Building Envelope - 3D View 2

GENERAL NOTE:
BALUSTRADES, PARAPETS, ROOF FEATURES, SERVICES POLES AND ANTENNA/ARIALS, AWNINGS, ARTWORKS, GARDEN PAVILIONS, KIOSKS, VEGETATION, SIGNAGE AND STRUCTURES CAN EXTEND BEYOND THE ENVELOPE

B. Public Domain Solar Access

Introduction

This study is prepared in conjunction withe the amended concept proposal for the Cockle Bay Park Development.

The study addresses submissions received regarding solar access to the public domain and nearby residential buildings.

Solar access to nearby residential buildings is controlled by the Apartment Design Guide.

The following areas have been studied:

Cockle Bay waterfront

- Mid winter lunchtime: No additional overshadowing
- Mid winter all day sun access
- Draft Central Sydney Planning Strategy proposed controls

Tumbalong Park and the children's playground

- No additional overshadowing

Future Town Hall Square

- Annual solar access
- Period and extent of overshadowing
- Analysis of the most affected day
- Overshadowing impacts on either side of the most affected days

Proposed new Northern Publicly Accessible Open Space

Crescent Garden

Nearby residential buildings

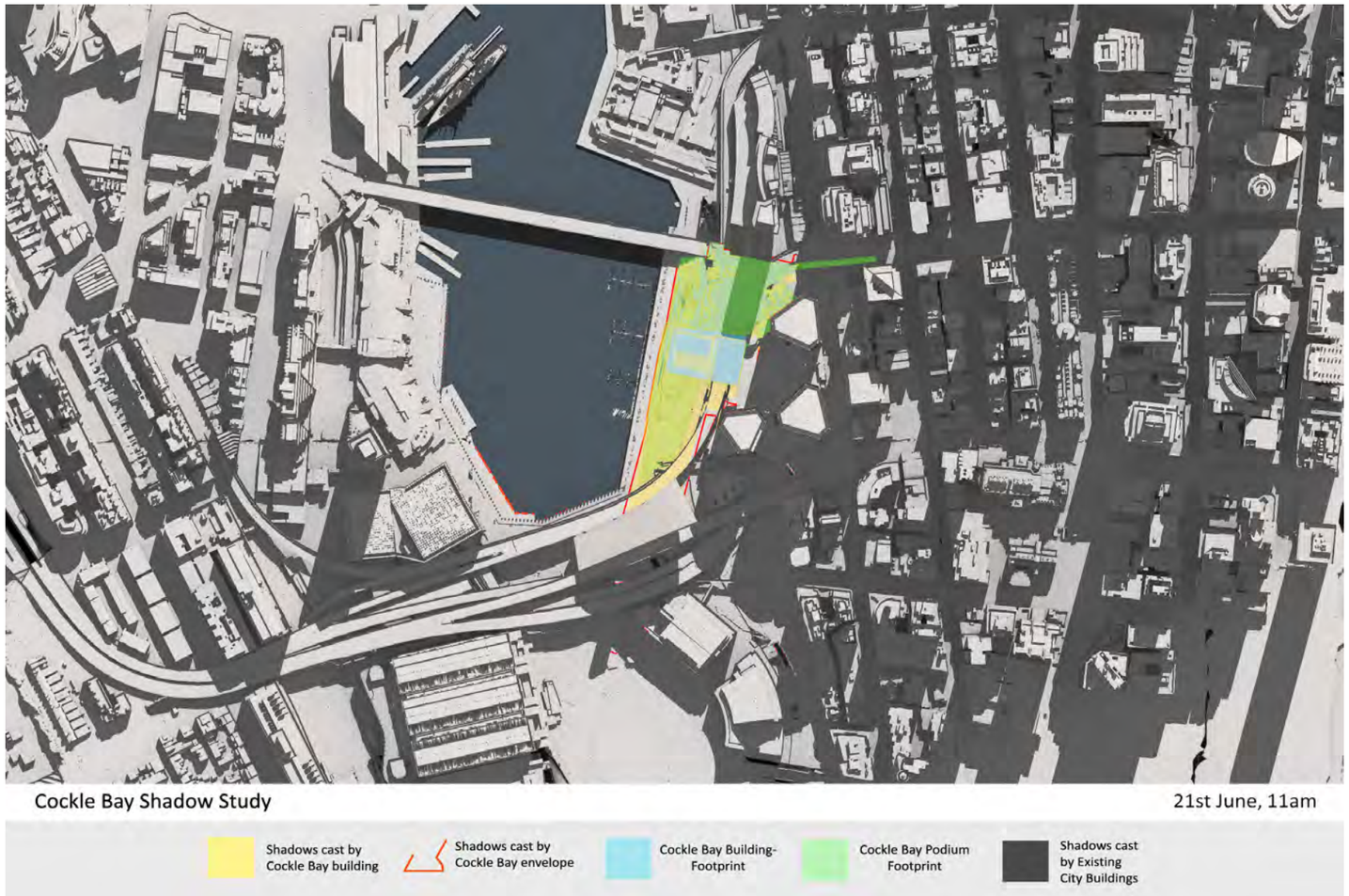


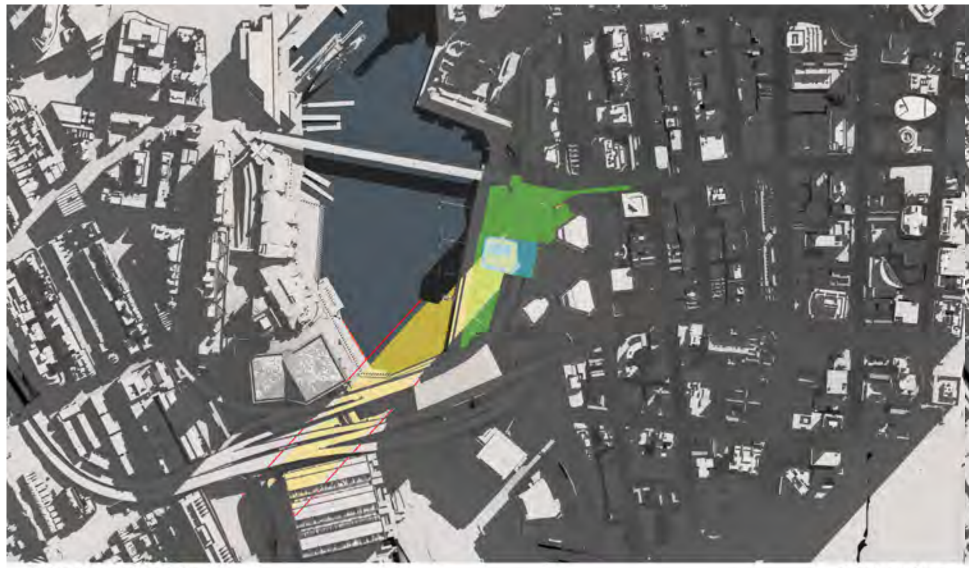
Fig. 78. 21st June 11am shadow visualisation by Virtual Ideas

Cockle Bay Waterfront

Mid winter lunch time

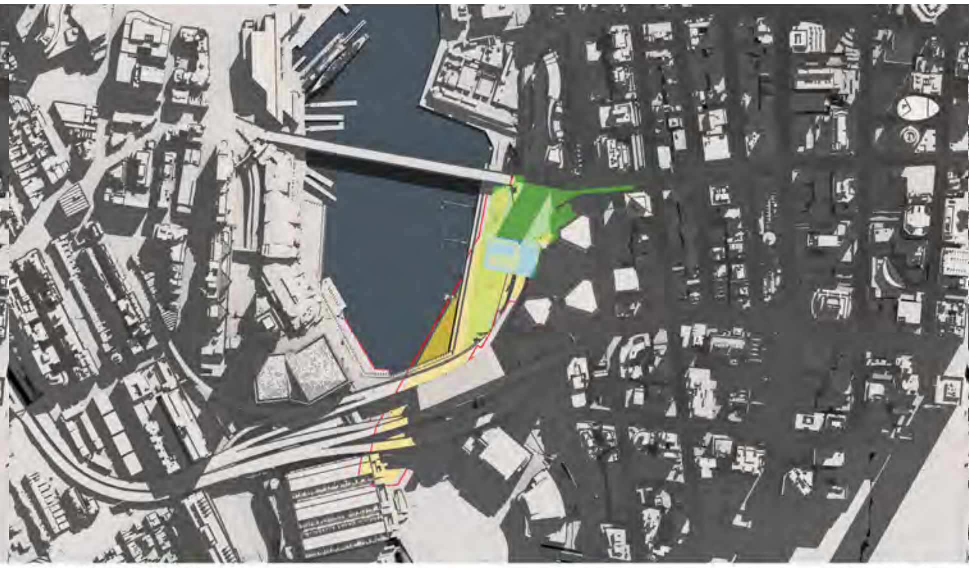
Property NSW have asked that the proposed development not affect the Cockle Bay Waterfront between 12:00 and 2:00pm on 21 June.

Sun studies between 11:00am and 3:00pm on June 21 (mid winter) indicate that the proposed development does not impact the waterfront at these times



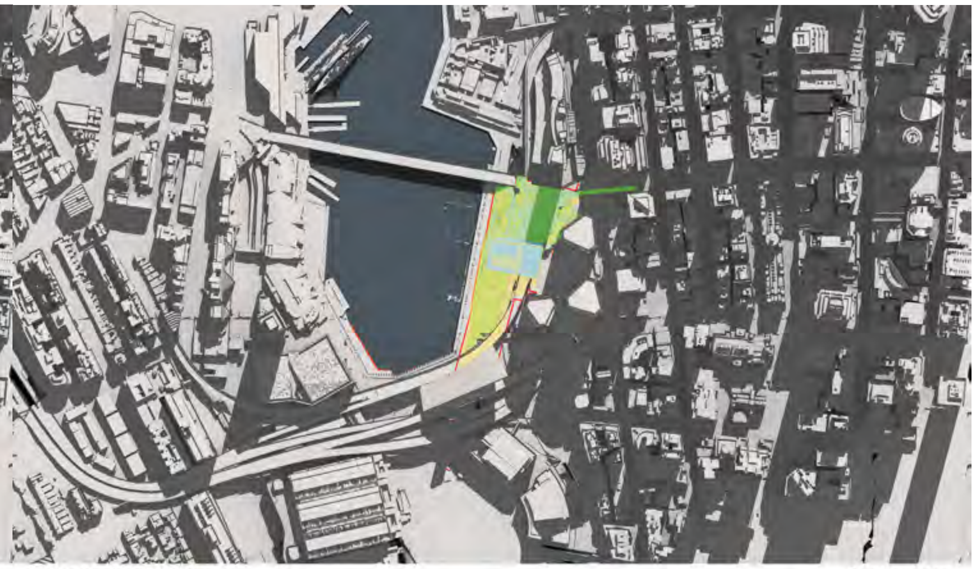
Cockle Bay Shadow Study 21st June, 9am

Shadows cast by Cockle Bay building
Shadows cast by Cockle Bay envelope
Cockle Bay Building-Footprint
Cockle Bay Podium Footprint
Shadows cast by Existing City Buildings



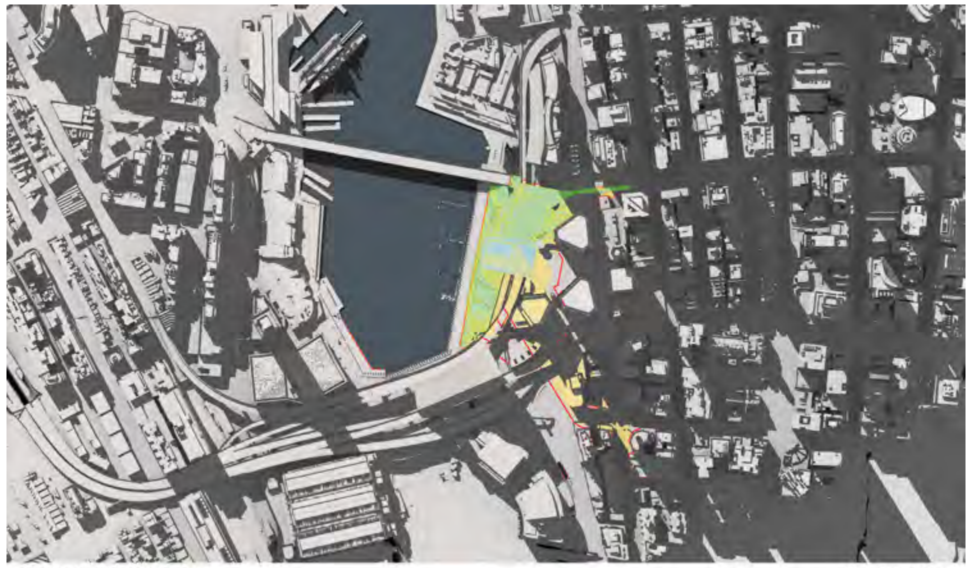
Cockle Bay Shadow Study 21st June, 10am

Shadows cast by Cockle Bay building
Shadows cast by Cockle Bay envelope
Cockle Bay Building-Footprint
Cockle Bay Podium Footprint
Shadows cast by Existing City Buildings



Cockle Bay Shadow Study 21st June, 11am

Shadows cast by Cockle Bay building
Shadows cast by Cockle Bay envelope
Cockle Bay Building-Footprint
Cockle Bay Podium Footprint
Shadows cast by Existing City Buildings



Cockle Bay Shadow Study 21st June, 2pm

Shadows cast by Cockle Bay building
Shadows cast by Cockle Bay envelope
Cockle Bay Building-Footprint
Cockle Bay Podium Footprint
Shadows cast by Existing City Buildings

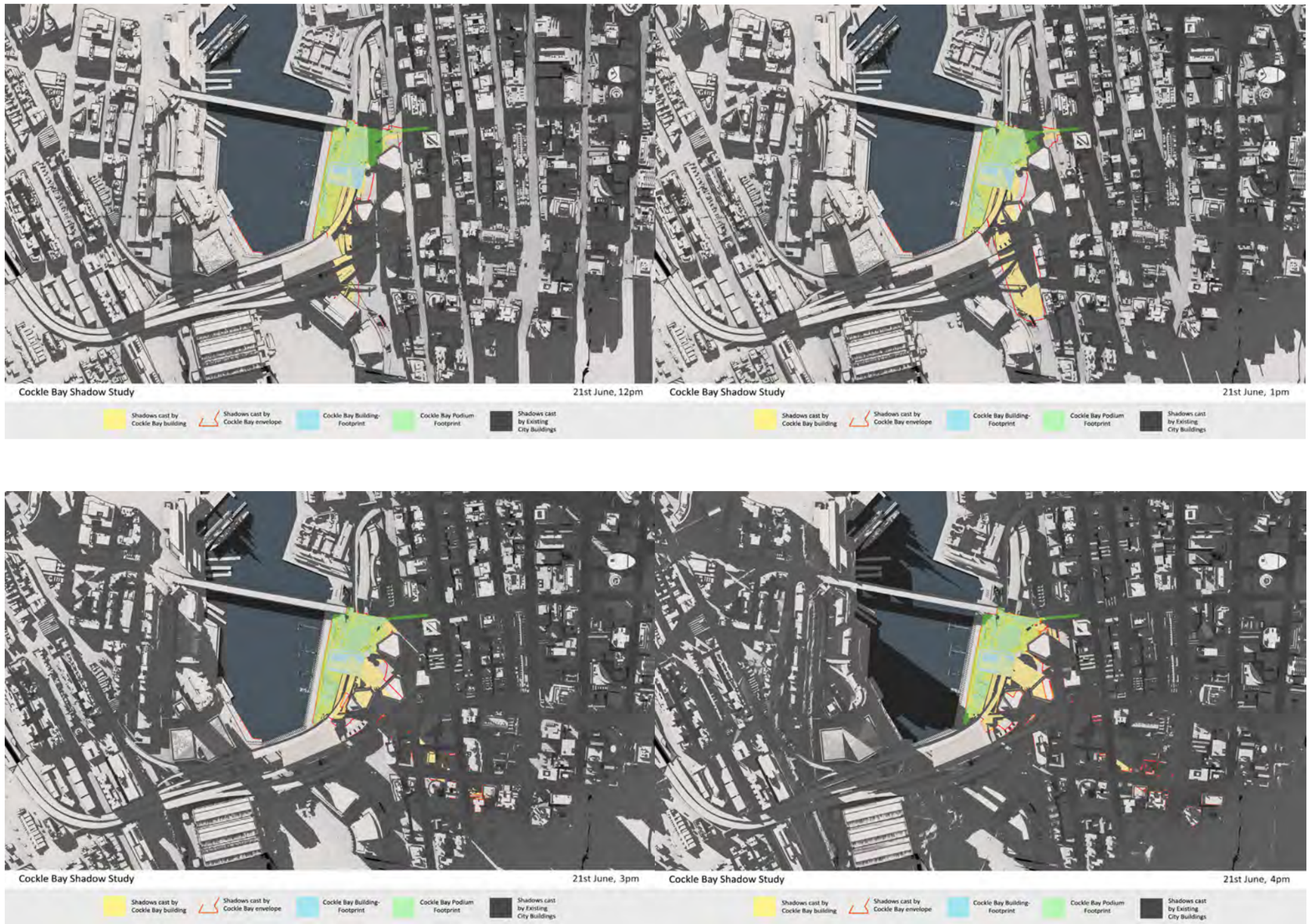


Fig. 79. 21st June shadow visualisations by Virtual Ideas

Mid winter all day

City of Sydney's submission following exhibition of SSDA - Stage 1 (SSDA 7684) raised concerns that the proposal would overshadow the eastern promenade at the winter solstice:

> *At the winter solstice the promenade offers 6 hours sunlight. The construction of the tower will reduce the amenity of this area, leaving it in shade*

The analysis illustrate that although reduced compared to the exiting condition, 5-6 hours of sunlight is maintained in mid-winter along the waterfront with the northern portion where the park comes down to the water receiving up to 8 hours.

Draft Central Sydney Planning Strategy (CSPS)

The draft Central Sydney Planning Strategy published by the City of Sydney in July 2016 defines the control period of protection for portions of the eastern waterfront from Darling Harbour to Barangaroo between 11:00am and 3:00pm mid winter and 9:00am to 5:00pm mid summer.

Sun studies between 11:00am and 3:00pm on June 21 (mid winter) indicate that the proposed development does not impact the waterfront at these times.

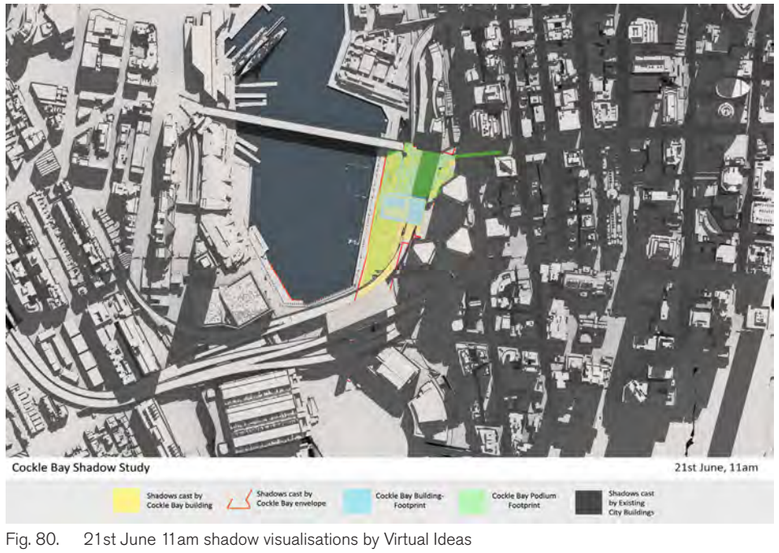


Fig. 80. 21st June 11am shadow visualisations by Virtual Ideas

Fig. 81. Cockle Bay waterfront Solar Analysis - existing June 21 11:00am - 3:00pm

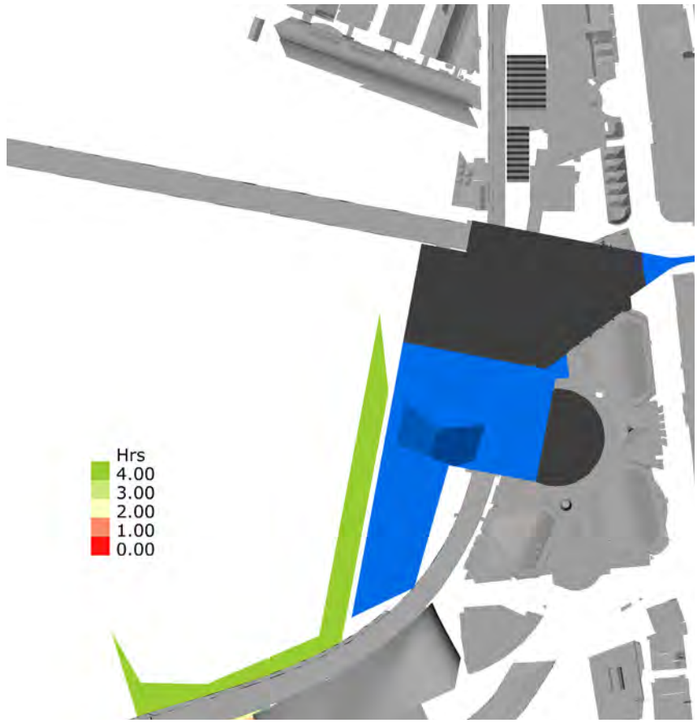


Fig. 82. Cockle Bay waterfront Solar Analysis - proposed June 21 11:00am - 3:00pm

The solar access study of the waterfront indicates that 4 hours sun access in maintained to the waterfront between 11am and 3:00pm on 21 June.

Solar studies for the draft CSPS control period have been undertaken to determine the overshadowing impact during these times. There is a reduction in sun hours in the morning along the centre of the eastern promenade as a result of the tower.

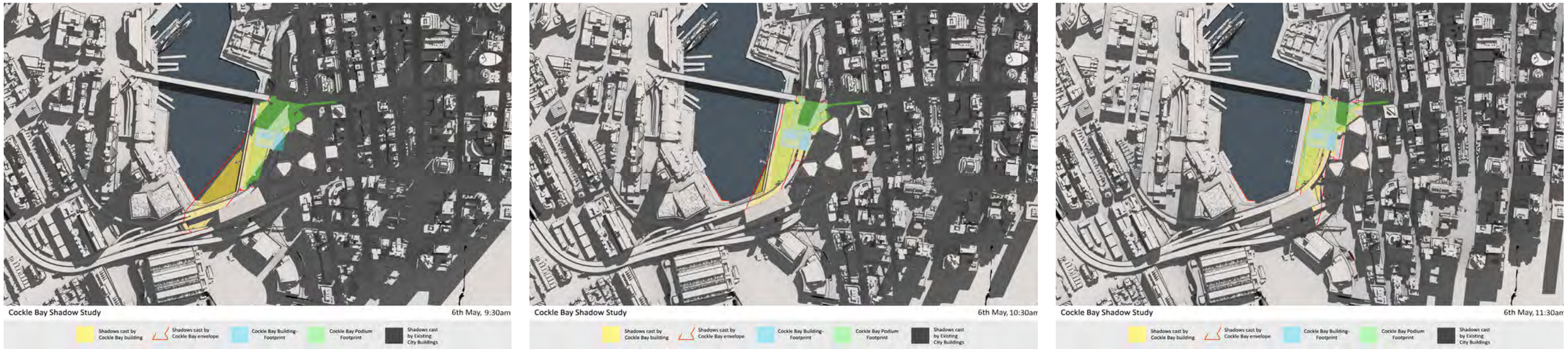


Fig. 83. 6th May shadow visualisations by Virtual Ideas

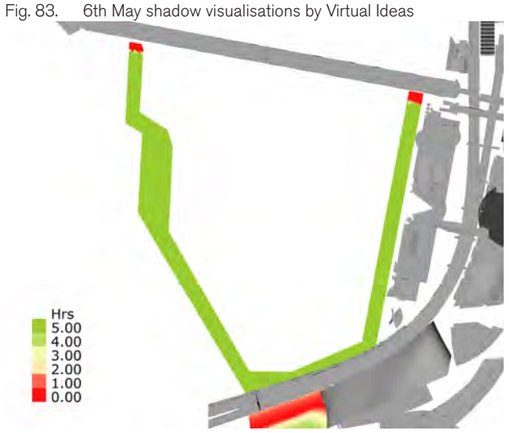
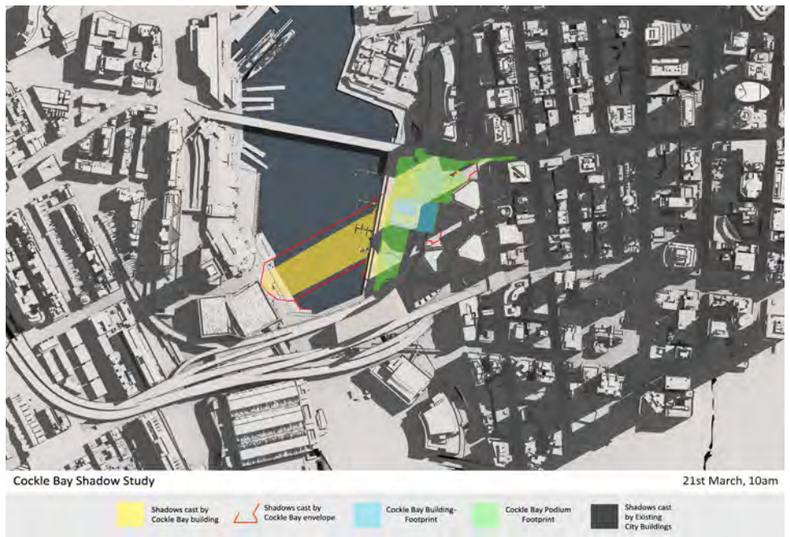


Fig. 84. Existing Solar Access - May 6 10:30am until 3:30pm

Fig. 85. Proposed Solar Access - May 6 10:30am until 3:30pm

Overshadowing study on 21st March from 10am to 12pm



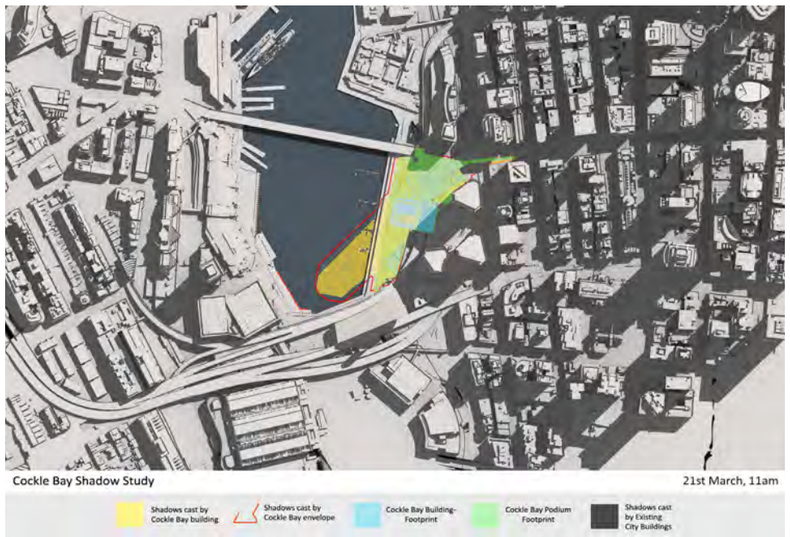


Fig. 86. 21st March shadow visualisations by Virtual Ideas

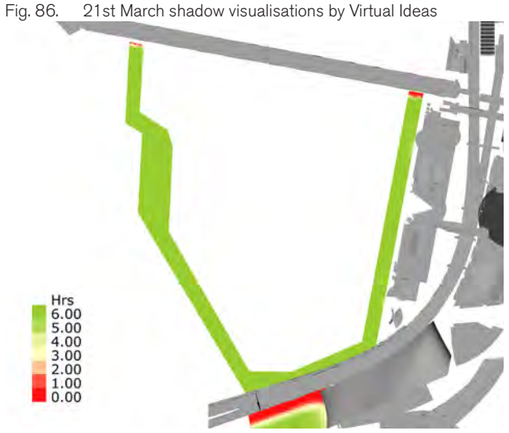


Fig. 87. Existing Solar Access - March 21 10:00am until 4:00pm

Fig. 88. Original Proposal Solar Access - March 21 10:00am until 4:00pm

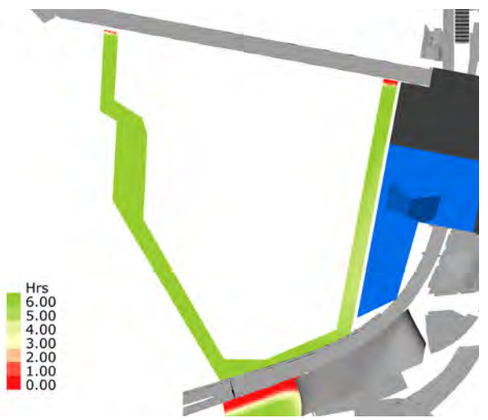
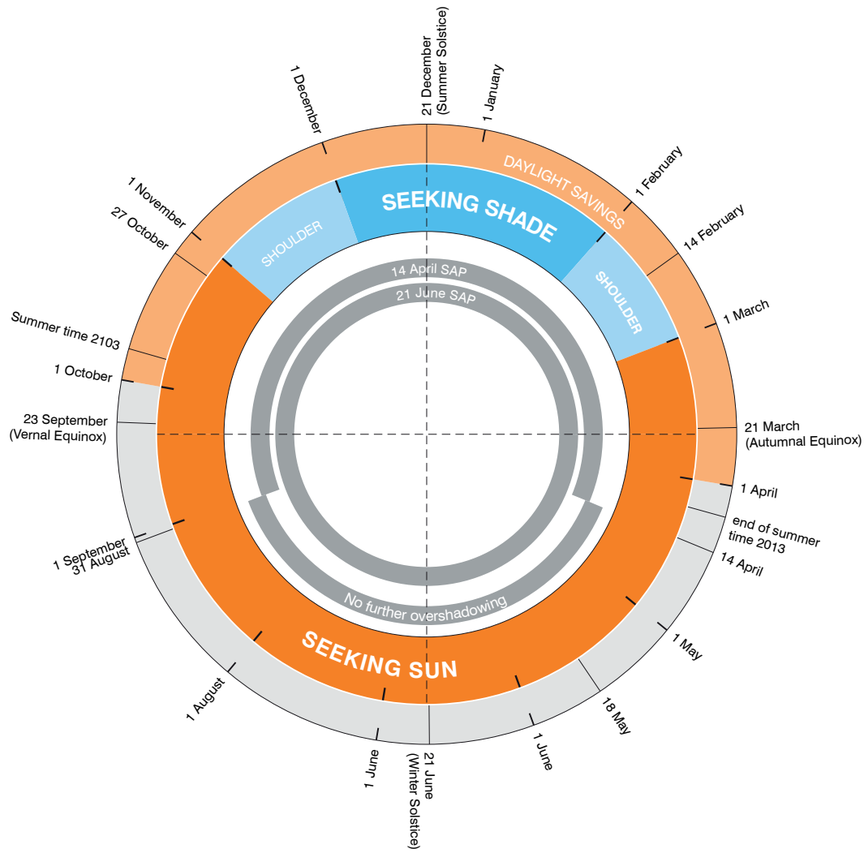


Fig. 89. Revised Concept Solar Access - March 21 10:00am until 4:00pm

The draft CSPS acknowledges that solar access is desirable during Spring. Winter and Autumn but less desirable in Summer with people more likely to seek shade as illustrated in the following diagram.



Solar Calendar from the draft Central Sydney Planning Strategy 2016

Overshadowing study on 4th Feb from 9:30am to 12:30pm

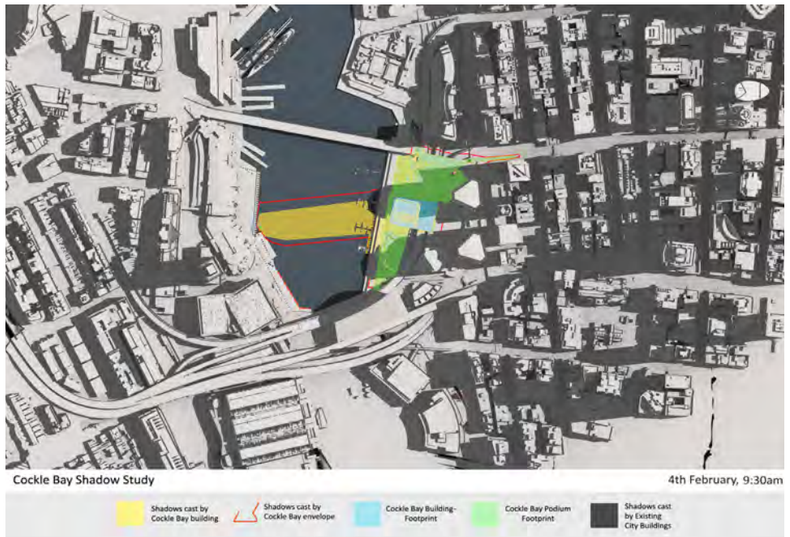
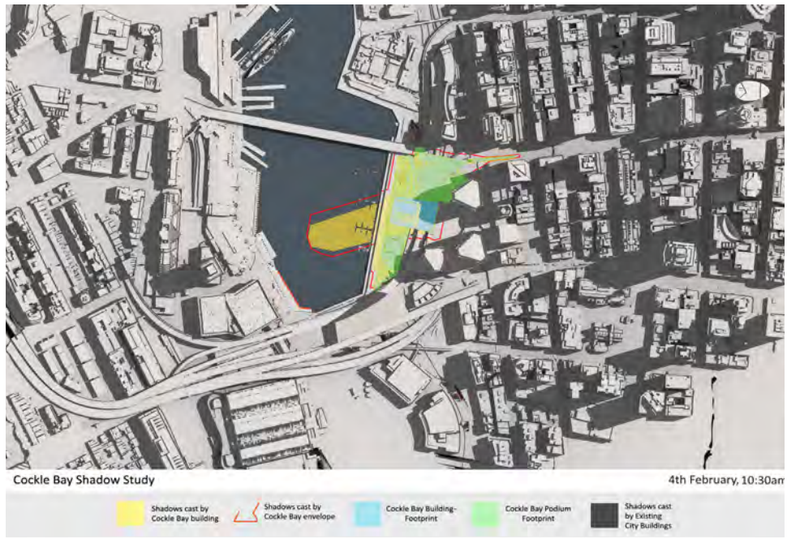
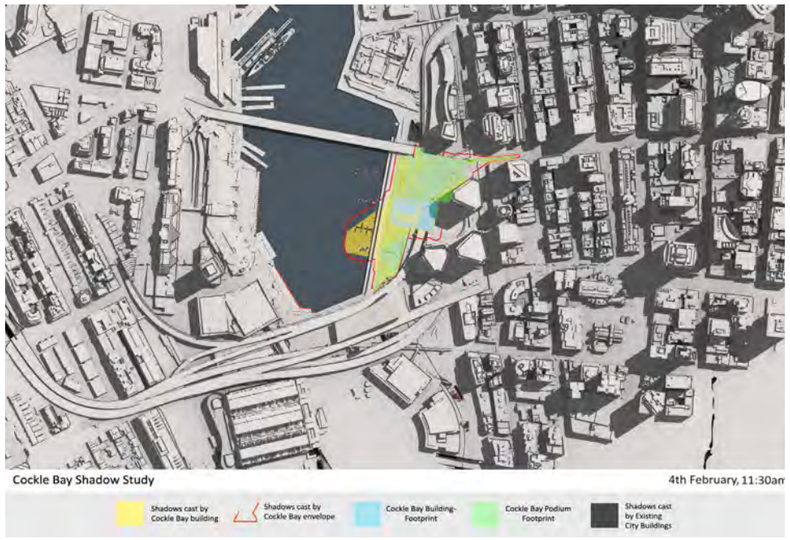
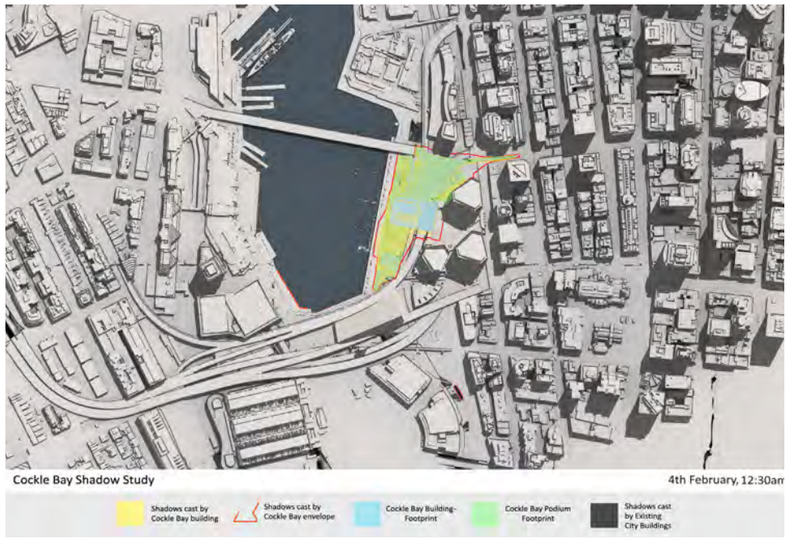


Fig. 90. 4th Feb shadow visualisations by Virtual Ideas







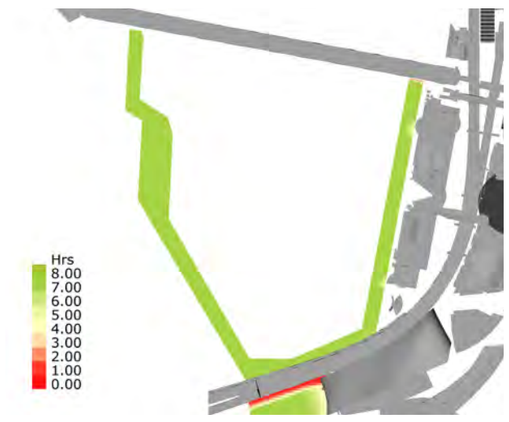


Fig. 91. Existing Solar Access - Feb 4 9:30am until 4:30pm

Fig. 92. Original Proposal Solar Access - Feb 4 9:30am until 4:30pm

Fig. 93. Revised Concept Solar Access - Feb 4 9:30am until 4:30pm

Overshadowing study on 21st December from 9am to 12pm

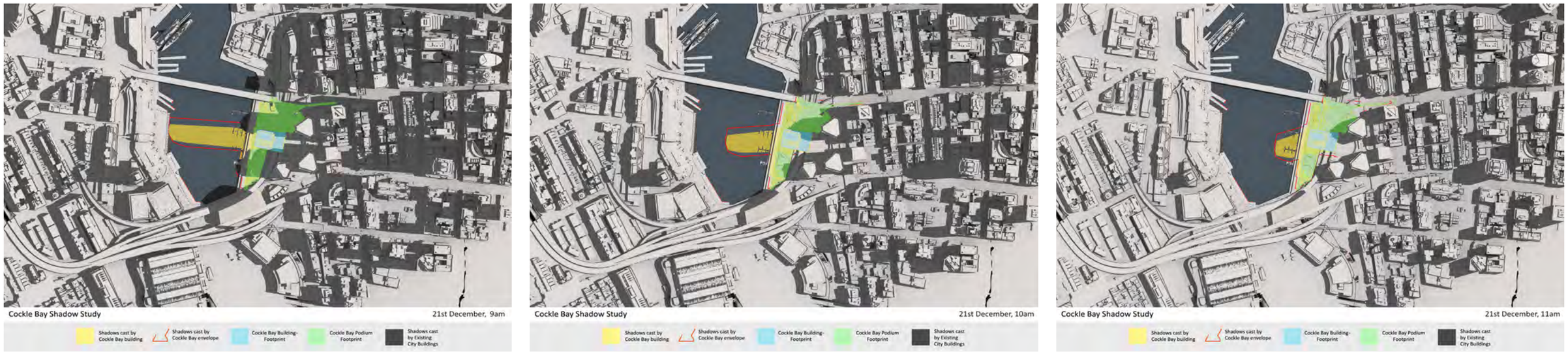


Fig. 94. 21st December shadow visualisations by Virtual Ideas

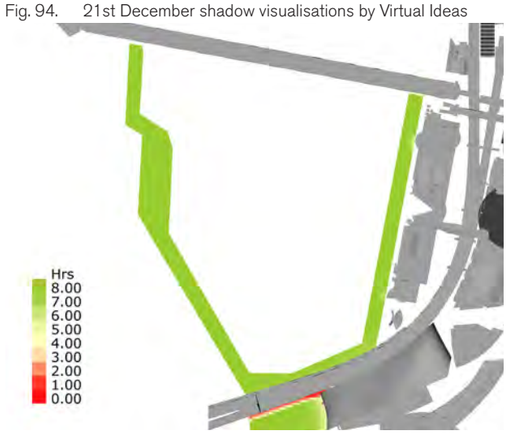


Fig. 95. Existing Solar Access - December 21 9:00am until 5:00pm

Fig. 96. Original Proposal Solar Access - December 21 9:00am until 5:00pm

Fig. 97. Revised Concept Solar Access - December 21 9:00am until 5:00pm

Existing levels of solar access along the eastern promenade are largely maintained during Spring, Winter and Autumn during the draft Central Sydney Planning Strategy proposed control period.

There is a reduction in solar access in Summer relative to the draft control period which is most prominent at the beginning and end of Summer. These times are less desirable based on the Solar Calendar from the draft strategy with people actively seeking shade during this period.

In all cases the extent of overshadowing has been reduced due to the increased tower envelope setback and reduced bulk.

Draft CSPS Control period overshadowing summary

Season	Control Period	Modelling Output	CSPS Calendar	Impact/Mitigation Measure
Summer	9:00am - 5:00pm	There is a reduction in sun access along the central third of eastern waterfront from 7-8 hours to 5 hours. Thus reduction occurs between 9:00am and 12:00pm	Seeking Shade	The original proposal impacted sun on the northern and southern 1/3 of the eastern waterfront. See figure 89 With the revised concept proposal the sun access reduction impact have been reduced to the central third only . See figure 90
Autumn/Spring	10:00am - 4:00pm	There is a reduction in sun access along the southern half of eastern waterfront from 6 hours to 4-5 hours. Thus reduction occurs between 10:00am and 12:00pm	Seeking Sun	The original proposal impacted sun on the southern half of the eastern waterfront for 2 hours and the northern 1/3 for 1 hour See figure 85 With the revised concept proposal the sun access reduction impact have been reduced to the souther half for 1 hour . See figure 86
Winter	11:00am - 3:00pm	Solar access is maintained during the control period	Seeking Sun	

Tumbalong Park and the children's playground

One of the design principles of the Cockle Bay Park Development is to avoid mid winter overshadowing of the public areas of Tumbalong Park and the Children's playground. This principle is based on the precedent set by the Ribbon development consent.

Two sun planes define the top of the proposed envelope, one at 12:00pm and one at 11:00am. The planes are generated from the roof line of the Ribbon development and project northward.

Tumbalong Park sun access plane

To verify the sun planes solar studies and solar access analysis were undertaken. These studies demonstrate that the proposed development does not generate any additional mid winter overshadowing of Tumbalong Park and the children's playground.

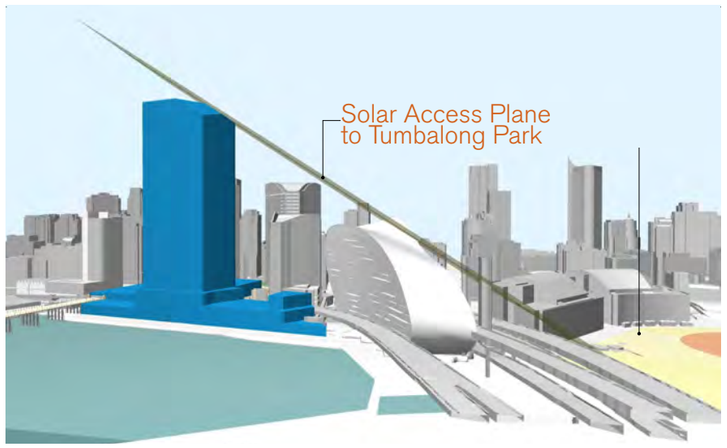
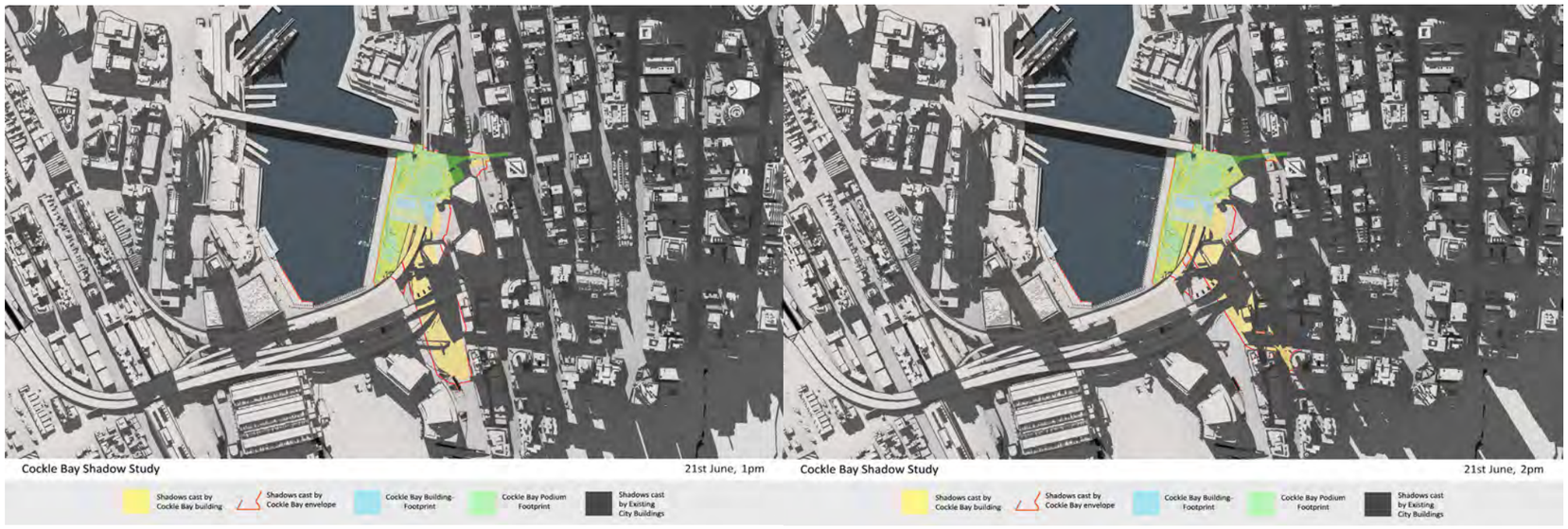


Fig. 98. 21st June shadow visualisations by Virtual Ideas



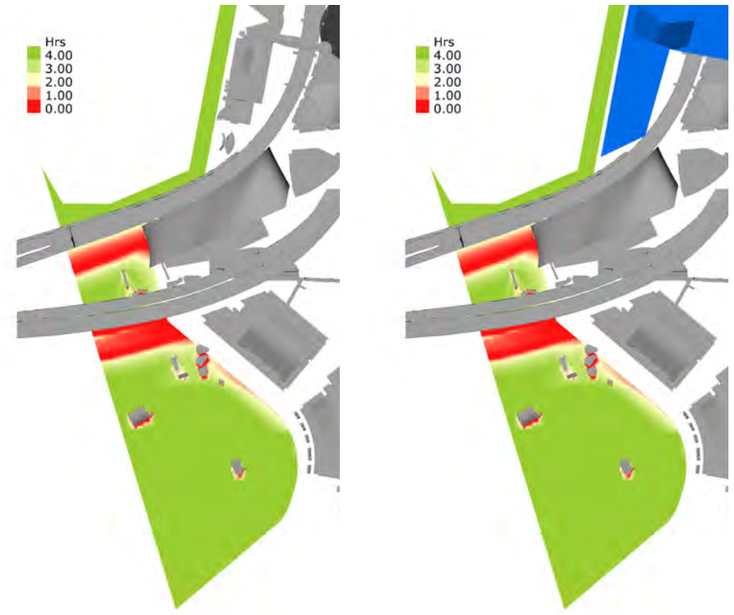


Fig. 99. Cockle Bay waterfront Solar Analysis - existing and proposed June 21 11:00am - 3:00pm

Future Town Hall Square

The draft CSPS includes planning controls identified a future Town Hall Square bounded by George Street, Park Street and Pitt Street. Combined with the identification of this new public space were new overshadowing controls protecting this potential future Square. These propose new overshadowing controls prohibit any additional overshadowing of the Square from 12:00pm until sunset throughout the year.

Fig. 100. Sun plane diagram for the future Town Hall Square from the draft Central Sydney Planning Strategy 2016

The original and amended concept proposal for the Cockle Bay Park Development creates additional (limited) overshadowing as the proposed envelope extends beyond the proposed cut of plane in the draft CSPS. The purpose of this solar access study is to provide a quantitative and qualitative analysis of the extent and impact of this overshadowing.

Annual solar access mapping

An analysis has been undertaken of the solar access to Town Hall Square over the course of the year. This is then compared with the solar access under the original concept proposal and the amended concept.

The proposed Future Town Hall Square receives between 650 and 1700 hours of sunlight over the year in the areas illustrated in the diagram below. (Refer to fig.102)

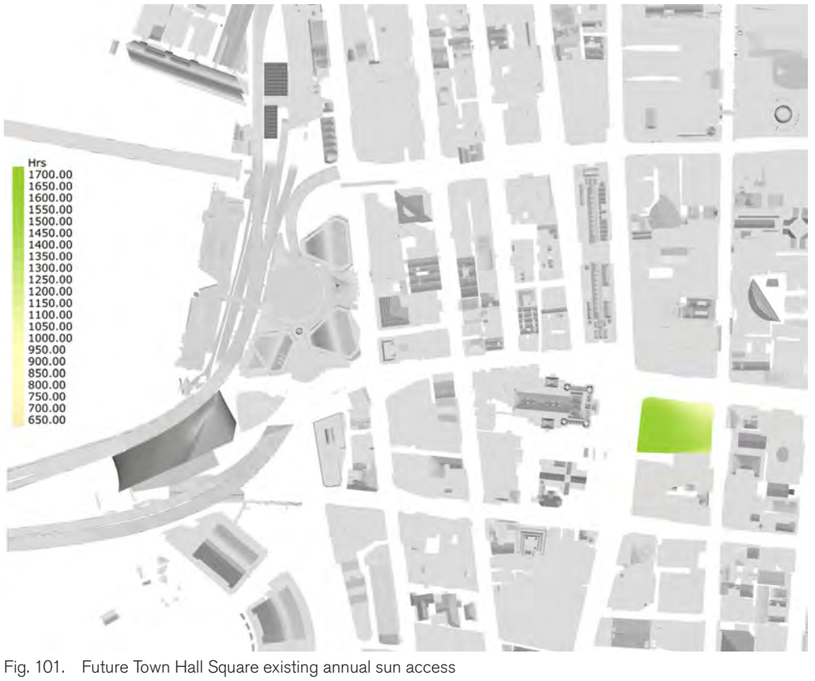


Fig. 101. Future Town Hall Square existing annual sun access

When the same analysis is applied with the original concept and the amended concept in place the impact is barely perceptible over the course of the year.

In its submission on the original concept the City of Sydney stated that:

> *"The northern and eastern parts of the Town Hall Square will be most affected. The impacted times of the year will be from the beginning of April to late April and from mid-August to mid-September. During these times the north east corner will lose up to 25% of its direct afternoon sun"*

This impact has now been reduced from a total of 21 to a total of 11 hours at the peak location in the north west corner (refer figure 104) over the period from the March equinox to mid April and Mid August to the Spring Equinox. The nature of this overshadowing impact is studied in detail below. It should be noted that this peak impact is occurring in an area of the proposed square which is receiving up to 1700 hours of sun annually as illustrated in the diagrams above.

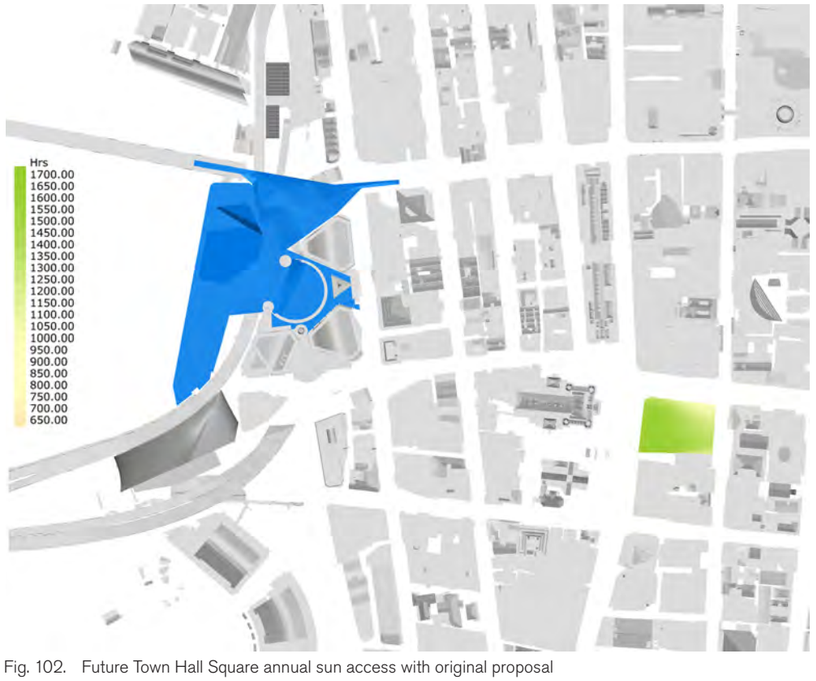


Fig. 102. Future Town Hall Square annual sun access with original proposal

Fig. 103. Future Town Hall Square annual sun access with revised concept

In order to understand the actual impact a difference calculation on the before and after solar access is taken. This reveals a maximum of 21 hours reduction over the course of the year in parts of the proposed square for the original proposal and a maximum of 11 hours over the course of the year reduction in the revised concept.

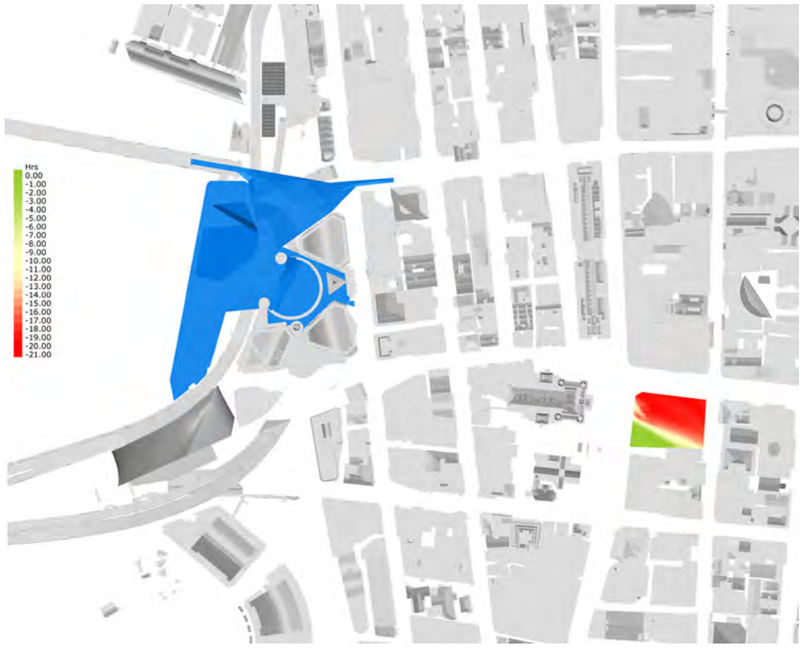


Fig. 105. Future Town Hall Square annual sun access with original proposal

Fig. 106. Future Town Hall Square annual sun access with revised concept

Period and extent of overshadowing

Solar analysis data was extracted from the model and charted to determine the times of year when overshadowing occurs and the extent of overshadowing which occurs during those periods. As the overshadowing is dynamic the extent of overshadowing is expressed as an average over the area the square. This analysis has been applied to the existing condition, the existing condition with the future metro station development, the original proposal and the revised concept.

In order to quantify the impact the differences can be charted as follows:

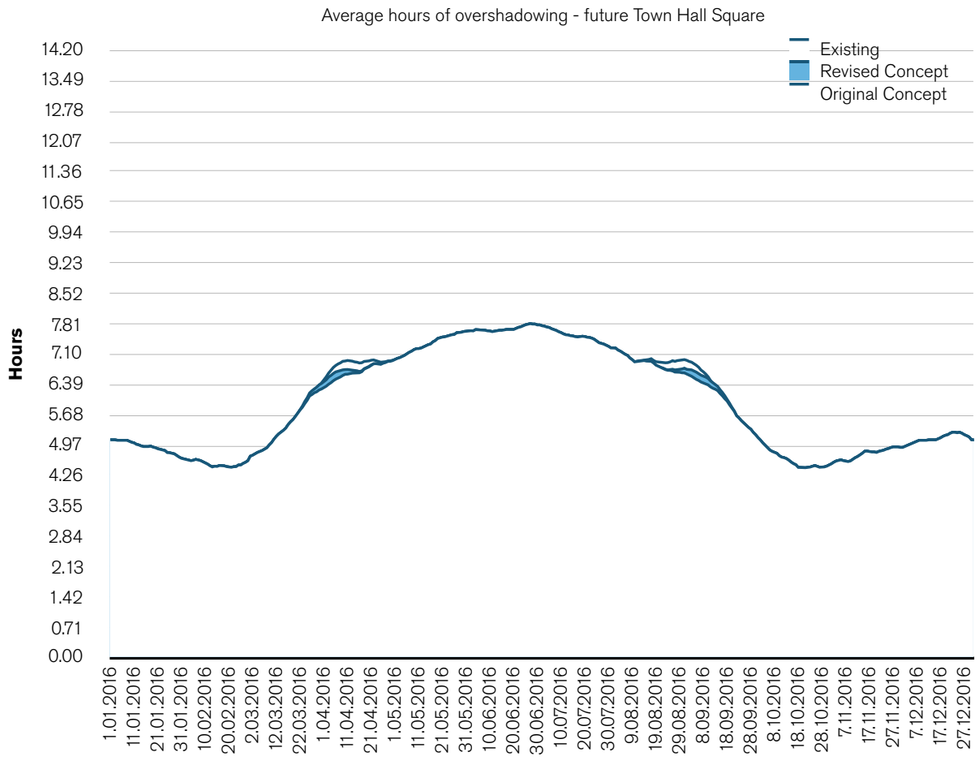


Fig. 107. Chart showing the annual overshadowing of the proposed Future Town Hall Square

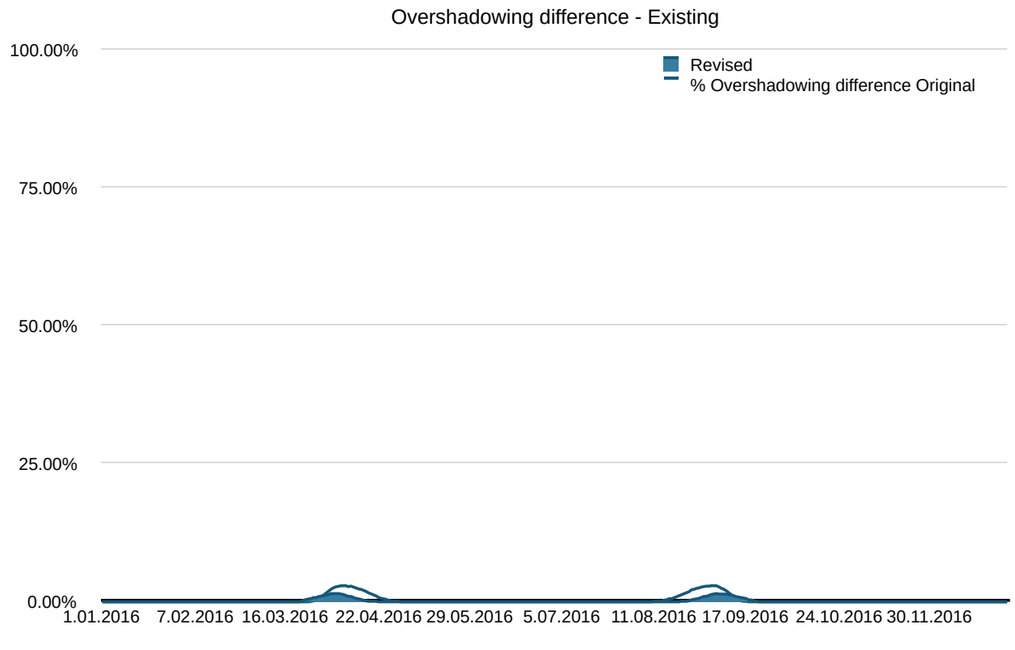


Fig. 108. Chart showing the annual overshadowing impact on the proposed Future Town Hall Square

The period of impact is approximately 1 month just after the Autumn equinox and just before the Spring equinox. The most affected days for the revised concept are 4 April and 5 September. The average overshadowing impact on the most affected days for the original and revised concepts are 2.9% and 1.5% respectively.

The following chart analyse the extent of overshadowing within the draft CSPS control hours.

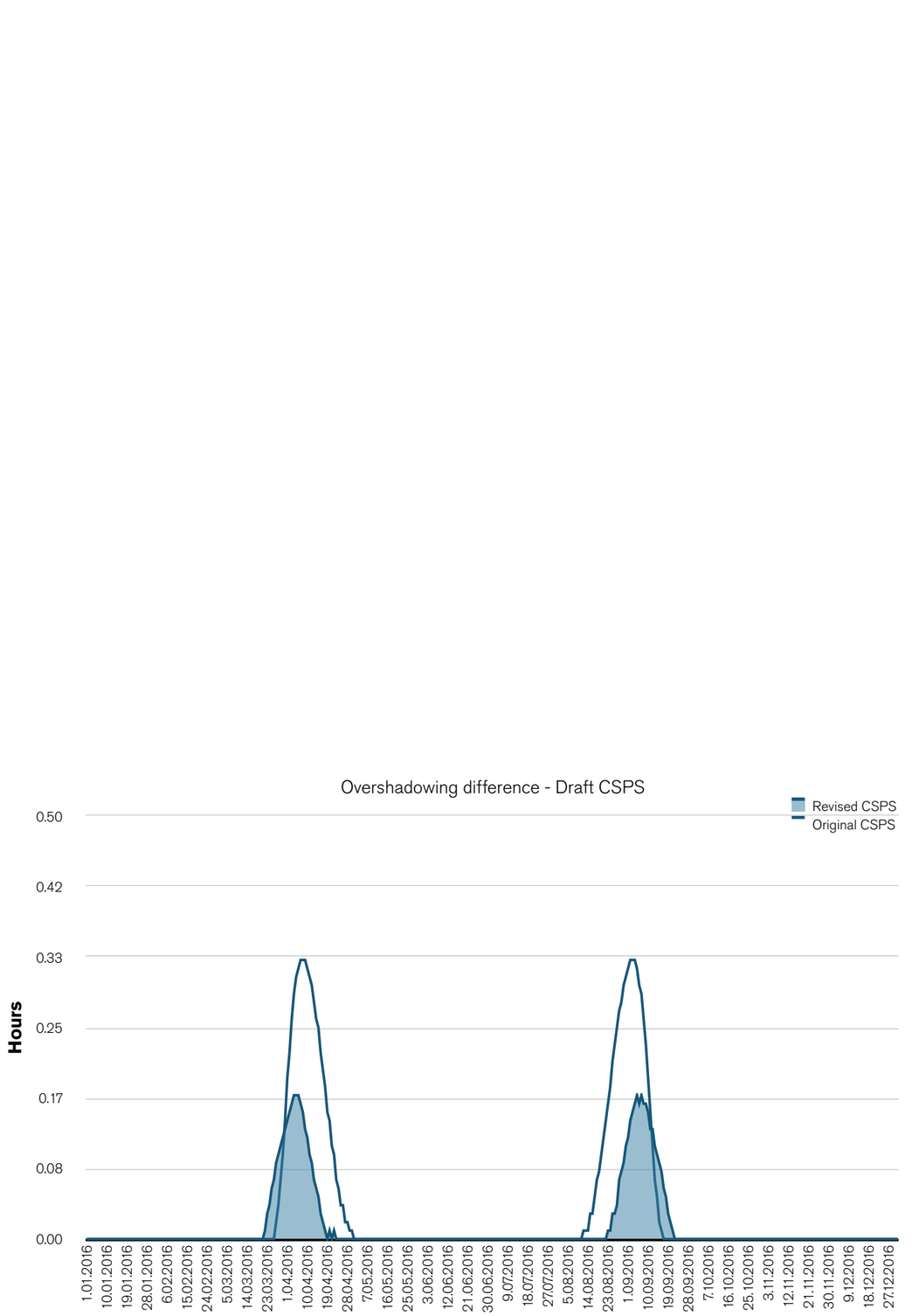
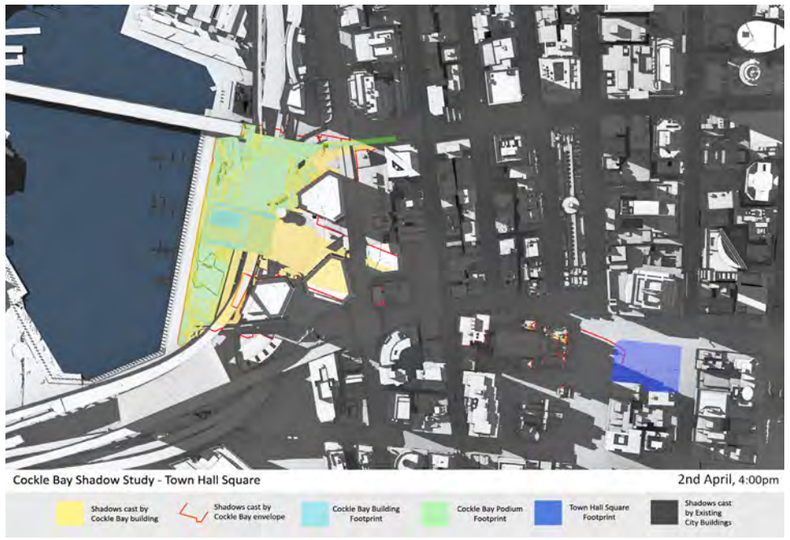


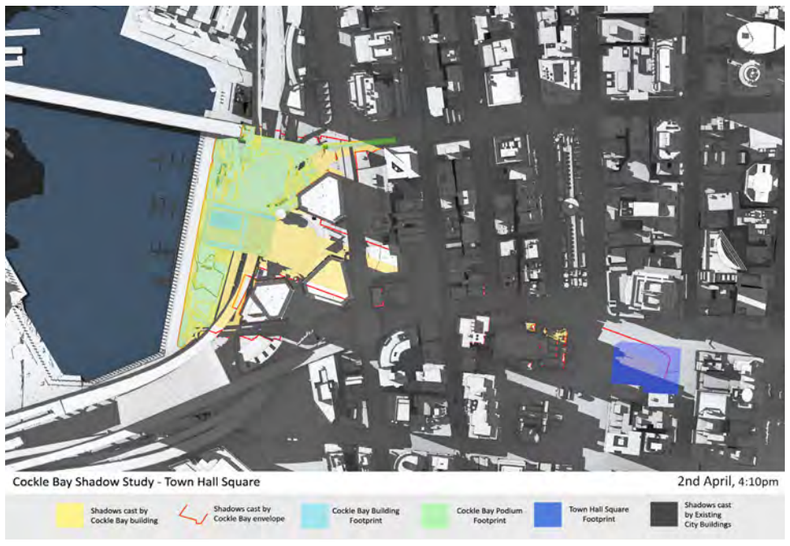
Fig. 109. Chart showing the annual overshadowing of the proposed Future Town Hall Square for the control period defined in the draft Central Sydney Planning Strategy 2016

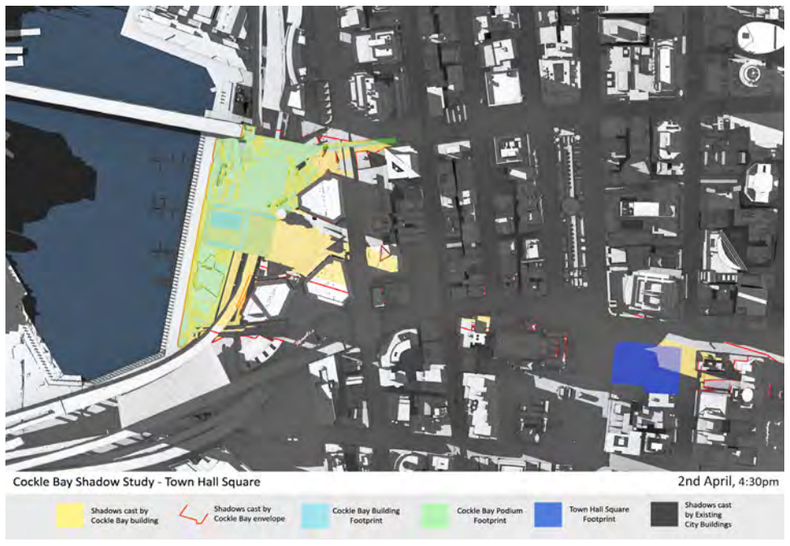
Analysis of the most affected day

In order to understand the impacts over the course of a day in the affected periods, solar access diagrams, eye level visualisations and a five minute interval solar access analysis has been undertaken for the most affected days.

The following solar access diagrams illustrate the movement of the shadow across the proposed town hall square in 10 minute intervals between 4:00pm and 4:30pm on the most affected days







The following chart illustrates the period and duration of overshadowing over the course of the maximum overshadowing day

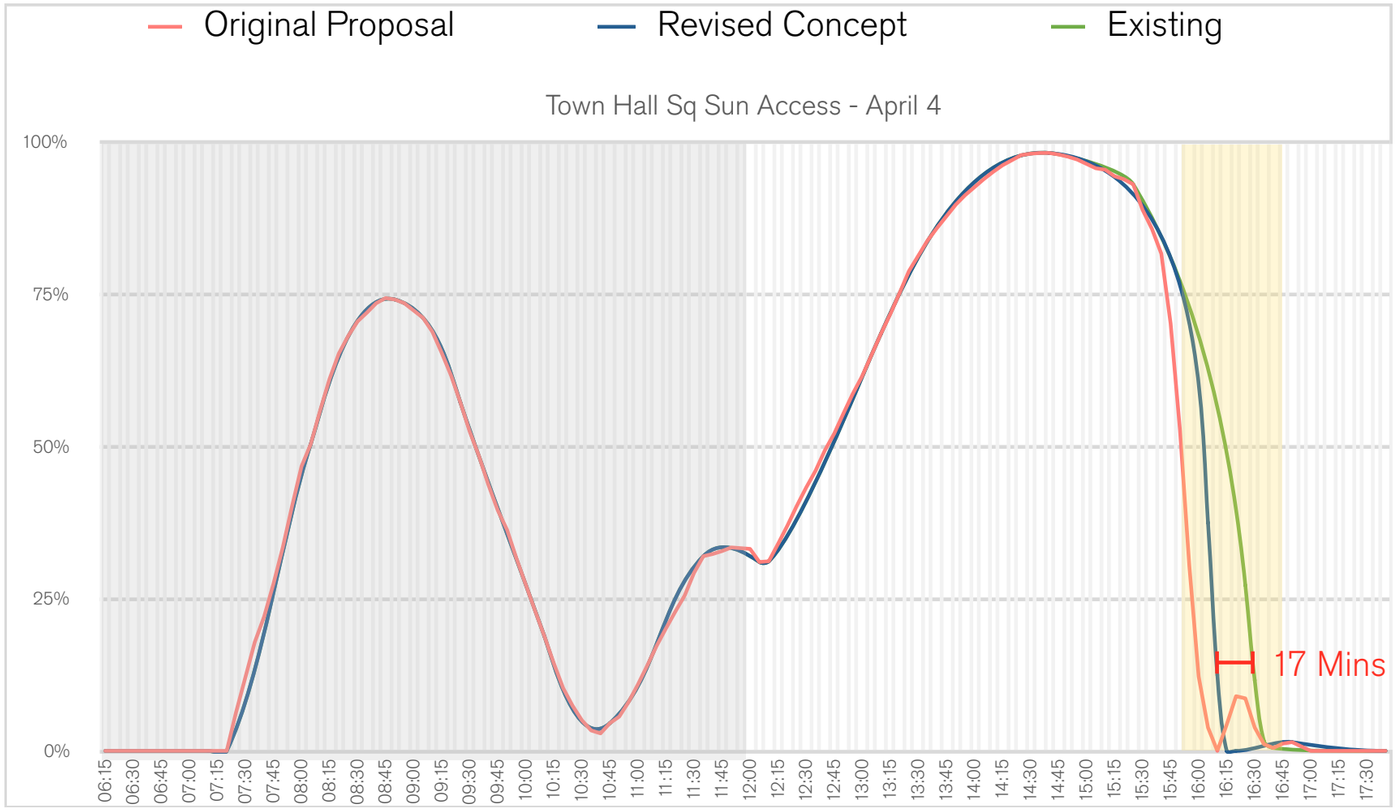


Fig. 110. Future Town Hall Square overshadowing for 4 April

Conclusion

Quantitative analysis

	Original Concept	Amended Concept
Annual average overshadowing (hours)	12	6
Maximum annual overshadowing at any point (hours)	21	11
Annual average overshadowing %	0.28%	0.15%
Duration of overshadowing period (days)	70	62
Dates of maximum overshadowing	11 April 5 September	4 April 5 September
Maximum overshadowing (%)	2.9%	1.5%
Duration of maximum overshadowing (minutes)	20	15

Qualitative assessment

The overshadowing impacts of the original and amended concept proposals occur just past the Autumn equinox and just before the Spring equinox for a period of approximately 3 weeks. The overshadowing occurs towards the end of the day between 4:00pm and 4:30pm for a period of 20 minutes for the original proposal and 15 minutes for the amended concept.

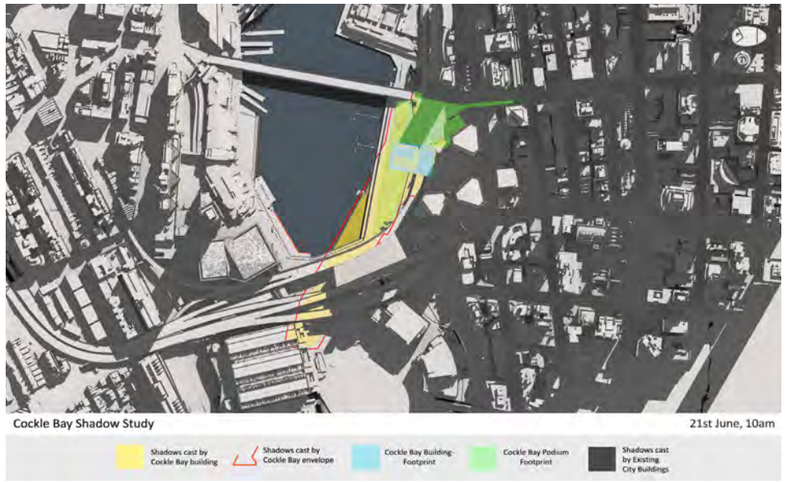
Sun access for these times of year and day is desirable, although it is probably not a peak period as it is late in the day but before the business day finishes. Weekends would be more significant. At the same time that solar access is blocked to Town Hall Square, a new 3000 sqm open space at Cockle Bay Park is created.

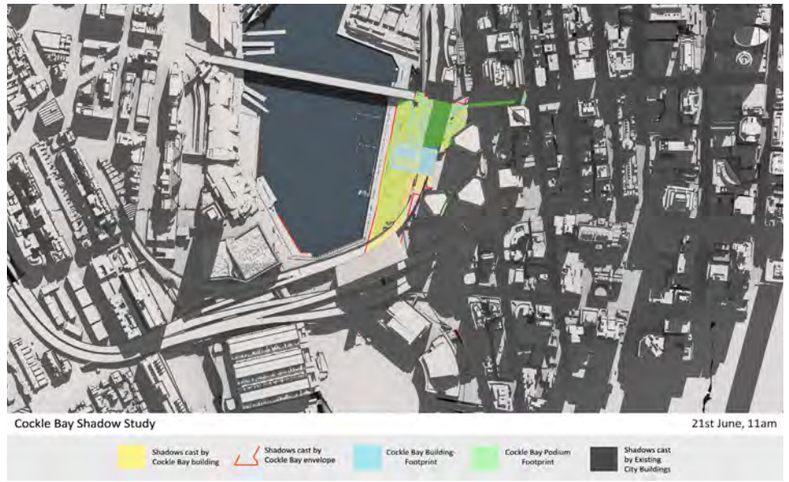
The period and extent of overshadowing is relatively small, occurring over a two week period with a maximum impact of 1.5% on the worst affected day relative to existing conditions. This impact drops off to zero two weeks on either side of the maximum. This small impact has been by more than half under the amended concept proposal.

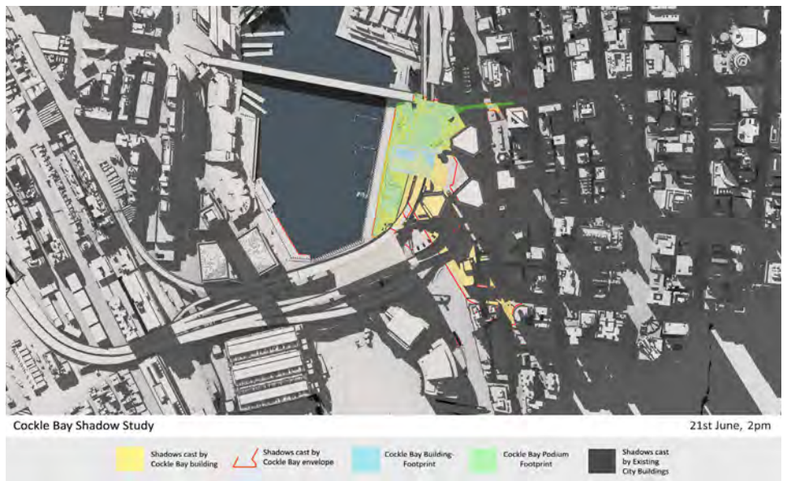
Proposed Northern Publicly Accessible Open Space

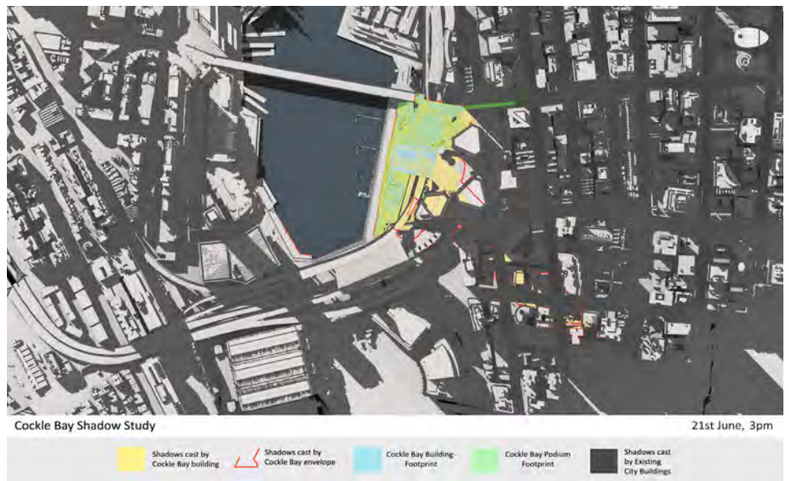
The proposed open space is intended as a significant new public area which connects the city to the harbour. It will be within a 5-10 minute walk to the proposed Future Town Hall square. A successful public space will have high levels of solar access, particularly in Autumn, Winter and Spring. The location of the park is conducive to good solar access from mid morning until late in the day through the year.

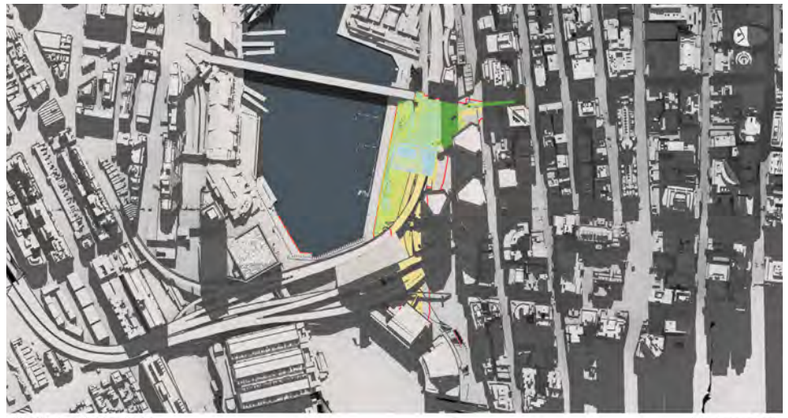
Solar Access has been analysed for two critical times: mid winter and the times when the proposed Cockle Bay Park Development impacts solar access to the proposed Future Town Hall Square.

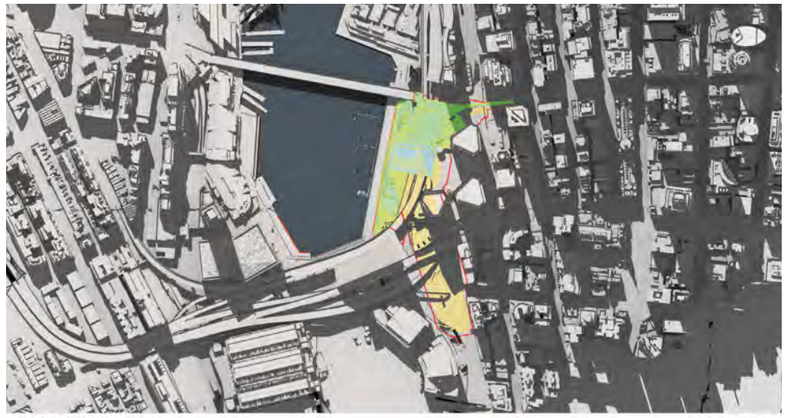


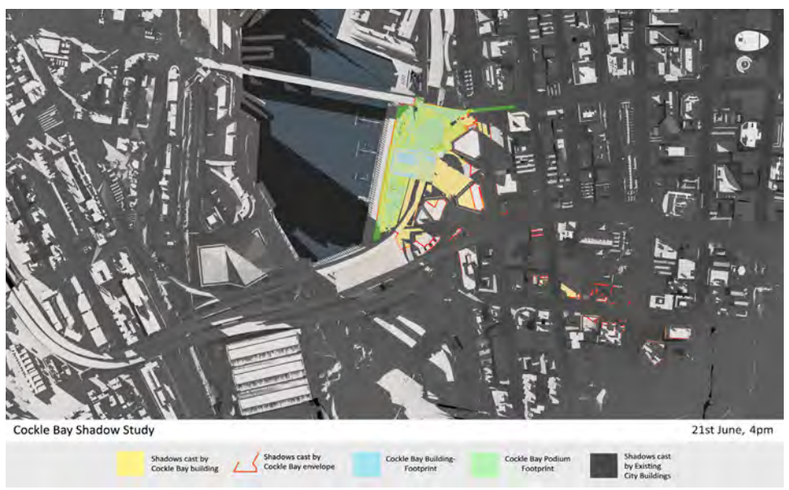












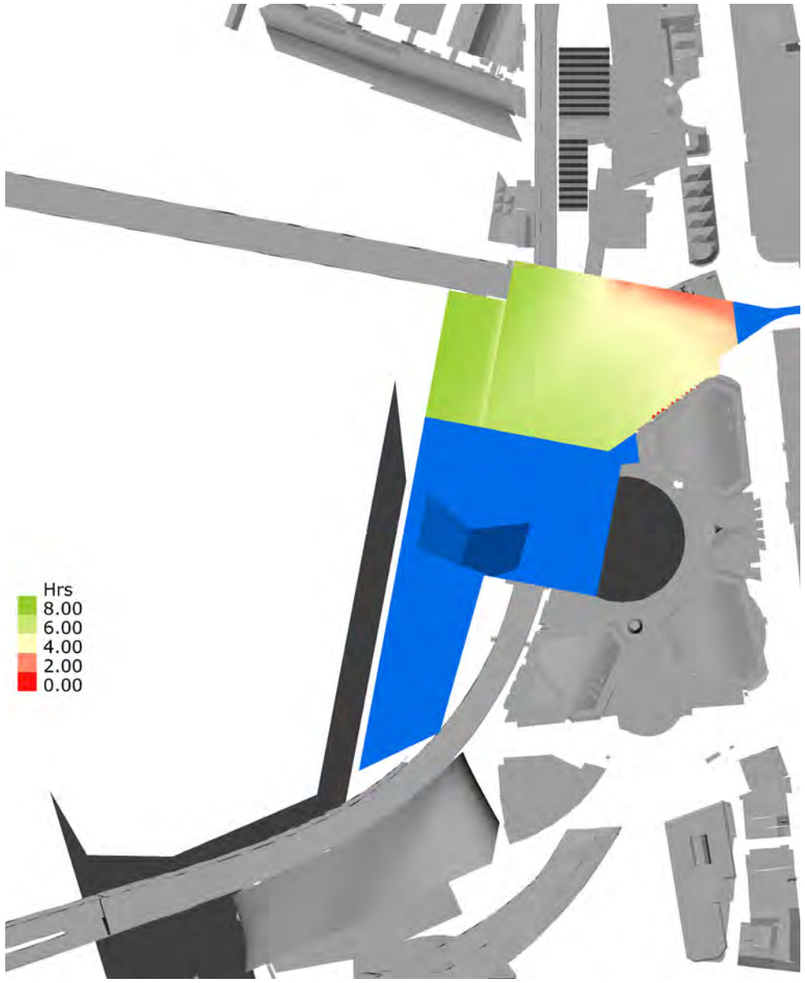
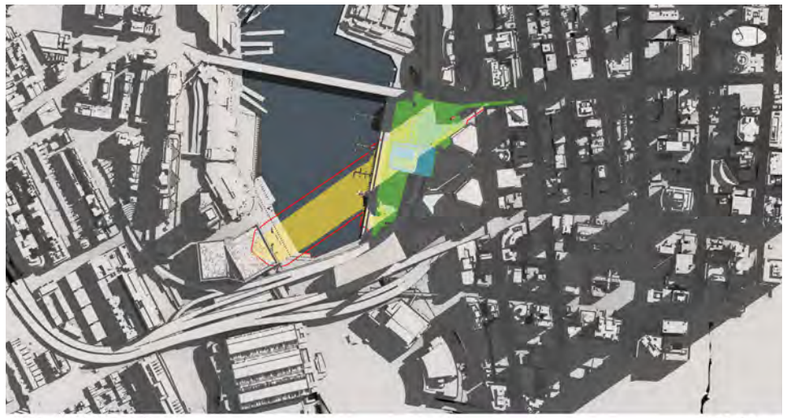
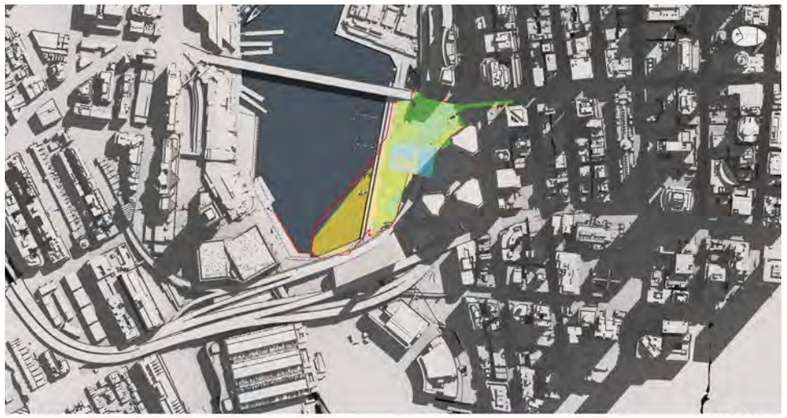


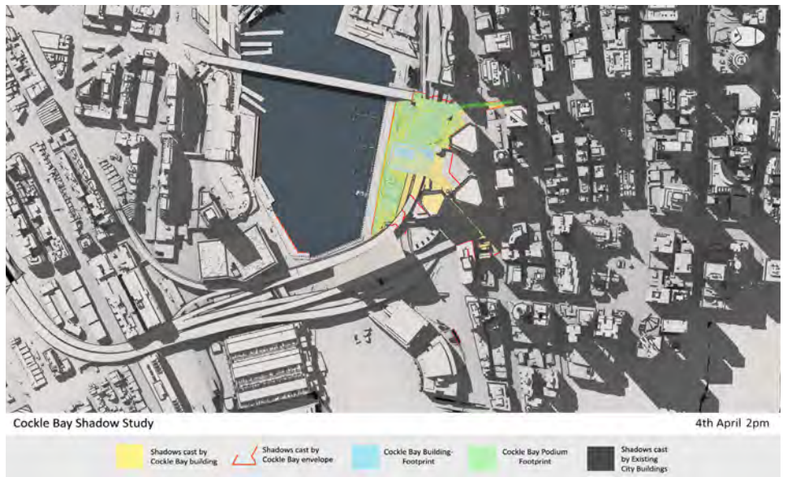
Fig. 111. Solar access analysis of the new park on 21 June

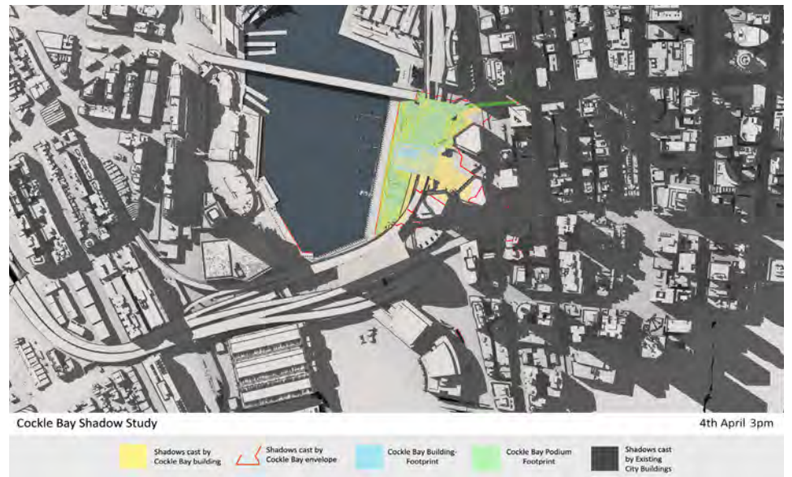

Cockle Bay Shadow Study
4th April 9am
Shadows cast by Cockle Bay building
Shadows cast by Cockle Bay envelope
Cockle Bay Building Footprint
Cockle Bay Podium Footprint
Shadows cast by Existing City Buildings


Cockle Bay Shadow Study
4th April 10am
Shadows cast by Cockle Bay building
Shadows cast by Cockle Bay envelope
Cockle Bay Building Footprint
Cockle Bay Podium Footprint
Shadows cast by Existing City Buildings

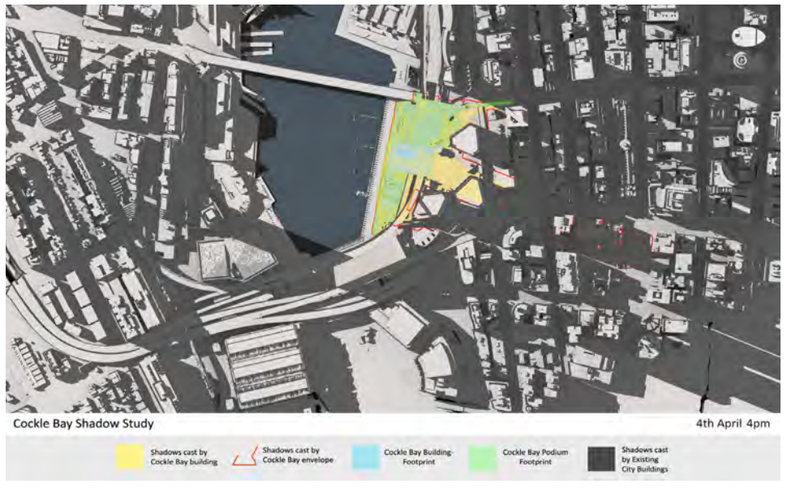

Cockle Bay Shadow Study
4th April 11am
Shadows cast by Cockle Bay building
Shadows cast by Cockle Bay envelope
Cockle Bay Building Footprint
Cockle Bay Podium Footprint
Shadows cast by Existing City Buildings

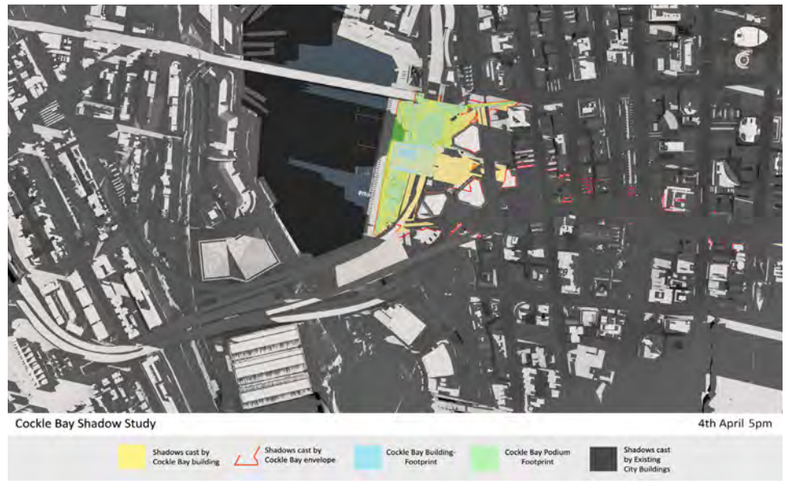

Cockle Bay Shadow Study
4th April 1pm
Shadows cast by Cockle Bay building
Shadows cast by Cockle Bay envelope
Cockle Bay Building Footprint
Cockle Bay Podium Footprint
Shadows cast by Existing City Buildings


Cockle Bay Shadow Study
4th April 2pm
Shadows cast by Cockle Bay building
Shadows cast by Cockle Bay envelope
Cockle Bay Building Footprint
Cockle Bay Podium Footprint
Shadows cast by Existing City Buildings


Cockle Bay Shadow Study
4th April 3pm
Shadows cast by Cockle Bay building
Shadows cast by Cockle Bay envelope
Cockle Bay Building Footprint
Cockle Bay Podium Footprint
Shadows cast by Existing City Buildings

The proposed new public space receives high levels of solar access throughout the Autumn. Winter and Spring periods. The proposed new public space receives 5 - 10 hours of sunlight on April 4 and September 5.





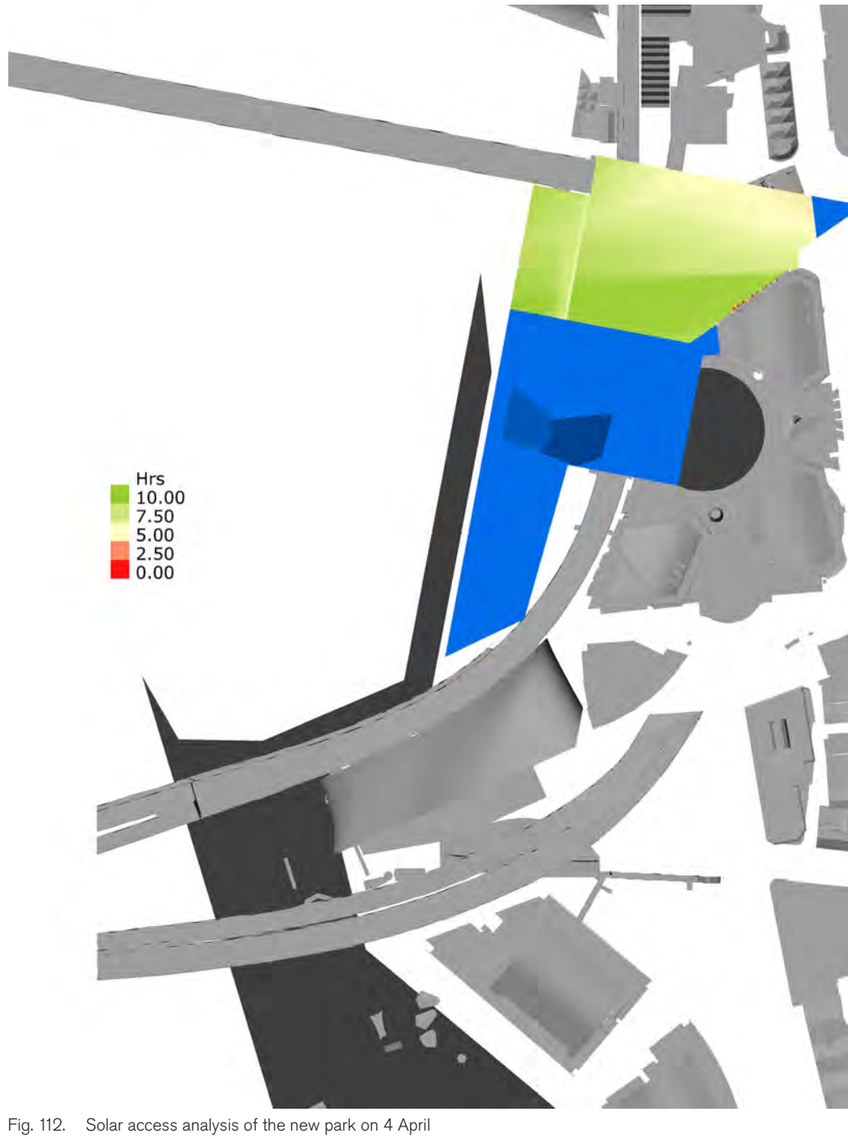


Fig. 112. Solar access analysis of the new park on 4 April

Crescent Garden

The overshadowing impacts on the Crescent Garden have been studied for winter lunchtime. The presence of the new podium and tower reduce the lunchtime winter sun access to the western portion of the garden. The eastern portion is preserved including the lateral sun penetration into the circulation areas of Darling Park complex.

The reduction in amenity in present garden is offset through the availability of the new Public Park immediately to the north.

Fig. 113. Crescent Garden proposed midwinter 12:00 - 2:00pm sun access

Nearby residential buildings

Solar access requirements to residential buildings is controlled by the recommendations of the Apartment Design Guide. This guide requires 2 hours solar access to living rooms, private open space and communal open space between 9:00am and 3:00pm on 21 June. Potentially affected residential buildings downstream from the proposed Cockle Bat Wharf redevelopment are the Astoria at 222 Sussex Street and the Meriton development at 230-234 Sussex street.

The solar study of the proposed envelope indicates that there will be no effect on these buildings between the hours of 9:00am and 3:00pm on 21 June.

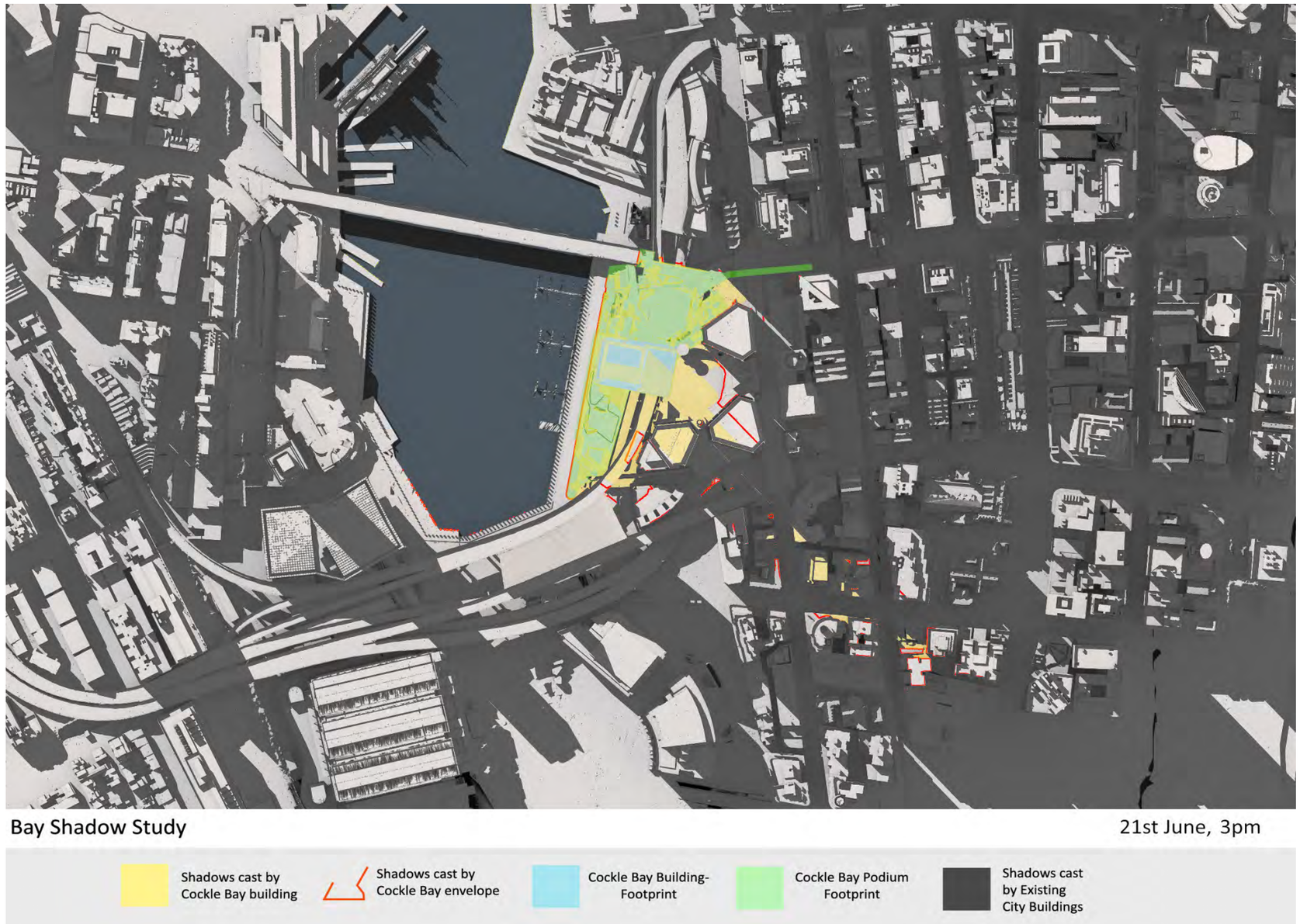


Fig. 114. 21st June 3pm shadow visualisation by Virtual Ideas